

RESEARCH ARTICLE**Immunological Monitoring of Pregnant Women Consulting at Mènontin Hospital, one of the Area Hospitals in Cotonou (Benin) in 2024**

Djaboutou Kafuyemon Ismanth¹, Fah Lauris², Otti André¹, Assogba Phénix^{3*},
Fabiya Kafayath³, Dougnon Victorien³

¹Lecturer-Researcher, Department of Continuing Education, National Medical and Health Institute, University of Abomey-Calavi, Benin

²Lecturer-Researcher, Department of Nursing Sciences, Department of Nursing Sciences, National Medical and Health Institute, University of Abomey-Calavi, Benin

³Researcher, Department of Human Biology Engineering, Research Unit in Applied Microbiology and Pharmacology of Natural Substances, University of Abomey-Calavi, Benin

*Corresponding Author: esseassogba1995@gmail.com

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Abstract

The present study began in the maternity ward and ended in the laboratory of the Mènontin Zone Hospital on pregnant women who came for prenatal consultation. To contribute to the diagnosis of fetomaternal alloimmunization, we carried out a prospective study on 156 pregnant women, considering all trimesters. The blood samples were taken on EDTA tubes and dry tubes; these samples allowed us to carry out the ABO and Rhesus grouping of these pregnant women and then search for irregular antibodies.

From the analysis of the samples, it appears that women are, on average, 27 years old and mainly belong to the age group of 25-30, i.e., a percentage of 30.13%. They are primarily first-time parents, with a rate of 34.62%, then women who have never had an abortion, with a rate of 62%. The predominant blood group is group O+. Fortunately, none of these women developed irregular antibodies. This work shows the importance of monitoring pregnant women and the effectiveness of the systematic administration of anti-D gamma globulins to all Rh-negative women.

Keywords- Allo anti-erythrocyte immunization, Diagnosis, fetomaternal alloimmunization, Immunology, Pregnant woman, Maternity and Benin

INTRODUCTION

Immunological monitoring of pregnant women is an essential component of antenatal care, aimed at monitoring and managing immune system changes during pregnancy. These changes are necessary to protect the mother and fetus. Pregnancy induces significant changes in the immune system to allow tolerance in the fetus, which is partly foreign to the mother's immune

system. These changes include a decrease in cellular immunity and an increase in humoral immunity aimed at balancing the protection of the mother and fetus.

Fetal-maternal Rhesus D alloimmunization is an immunological condition when a Rhesus (Rh) negative pregnant woman develops antibodies against her fetus's Rh-positive red blood cells. This phenomenon can cause severe complications for the fetus and newborn (1). It is a rare

pathology but responsible for avoidable perinatal morbidity and mortality (in utero death, anasarca, severe fetal and neonatal anemia, prematurity, and serious neonatal jaundice) (2). It is an immunological reaction resulting in the mother's production of alloantibodies against a blood group antigen present in her fetus and transmitted by the biological father. This process is responsible for a condition that affects the newborn and is called "Haemolytic Disease of the Newborn (MHNN)" (3).

Exposure to this pathology can occur during pregnancy or childbirth (4, 5). The mother's immune system can produce antibodies against the D antigen in fetal red blood cells. If these antibodies cross the placenta, they can attack the fetal red blood cells, leading to hemolytic anemia, hemolytic disease of the newborn (HND), and even fetal hydrops in severe cases. Indeed, the first exposure to Rh+ red blood cells generally does not cause immediate problems, but it sensitizes the mother's immune system, producing anti-D antibodies (6). On subsequent exposure (in a subsequent pregnancy, for example), the mother's anti-D antibodies can cross the placenta and destroy the red blood cells of the Rh+ fetus, leading to severe complications (6).

Its frequency has decreased considerably since the generalization of anti-D immunoglobulin injections in RhD-negative women during pregnancy and after childbirth (7) and also due to the excellent monitoring of pregnant women during the various prenatal consultations (6). The diagnosis of fetomaternal incompatibility is based on the search for irregular agglutinins and other tests, such as the KLEIHAUER test.

In Benin, even if previous studies have been carried out to raise the alarm, no recent research has been carried out to study prenatal monitoring and search for Irregular Antibodies in pregnant women as well as the problem with fetomaternal incompatibilities in women in immunization (8). Therefore,

this study's general objective is to contribute to the diagnosis of anti-erythrocyte alloimmunization in pregnant women consulting the Mènontin zone hospital.

MATERIALS AND METHODS

Frame

This study was carried out at the Mènontin Hospital in the maternity and laboratory departments.

Material

As a material, we used survey sheets and the medical files of the women consulting the collection tubes (EDTA tubes and tubes without anticoagulant).

Type and Period of Study

The present study is prospective research with an analytical aim that extended over three months, from March 6 to June 20, 2024. We mainly worked in the maternity ward and the laboratory during this period.

Inclusion Criteria

Included were pregnant women consulting at the Mènontin hospital during this period and who gave their explicit and informed consent.

Study Population

The study population consisted of 156 pregnant women consulting at Mènontin Hospital.

Methods

We mainly worked in the maternity ward and the laboratory during this period. We have organized ourselves to go to the maternity ward every morning to collect consultation frequencies and vaccinations, take samples from pregnant women, and send them to the laboratory no later than noon. The various manipulations were

carried out in the Mènonтин Health Center (CSM) laboratory on 156 blood samples from pregnant women. The samples were taken on EDTA and dry tubes. The test red blood cells were prepared in tubes using blood from known donors and the panel (8 RBCs with known blood group O). After collecting the blood in EDTA and dry tubes, the samples were brought to the laboratory for manipulation. The samples were centrifuged at 3000 revolutions for 3 minutes to collect the serum or plasma for the various tests. The GS-Rh is a test that makes it possible to determine the ABO blood group and the rhesus factor of an individual. Two complementary tests are used to carry out blood grouping and determine the Rhesus factor: BETH-VINCENT and SIMONIN.

Statistics

Data collection, graphs, and tables were drawn using Microsoft EXCEL 2010 software.

RESULTS

The average age of the pregnant women covered in our study is 27 years old; these pregnant women belonged to different age groups; the most representative age group is the group [25-30] with a percentage of 30.13%, followed by that [20-25] which represented 20.70%. The age group of [15-20] represented only 3.85%, and that of [40-45] is 0.64% (Fig. 1). We note that more than half of the women in our study are in their 3rd trimester, a percentage of 61.56% and those who are in the 1st trimester represented only 14.10% (Fig. 2). We note that more than half of the women are on their 3rd procedure or more, a percentage of 53.85% (Fig. 3). We note that 40.38% of the women in our study have had to abort at least once in their life (Fig. 4). Fig. 5 shows us the number of times that the woman had to give birth and shows that the majority of these women are multiparous and represented 65.38%. First-time women represented only 34.62%.

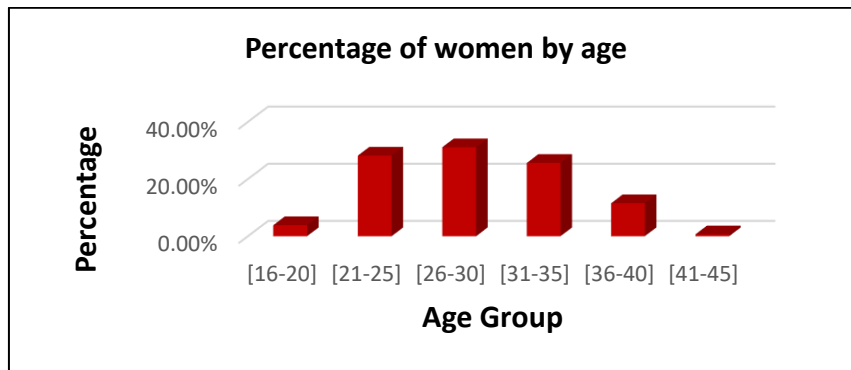


Figure 1: Distribution of women by age.

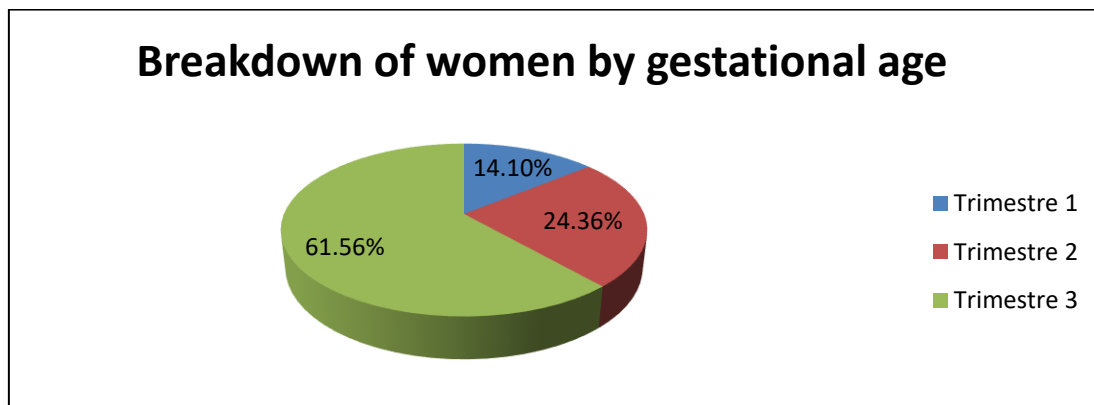


Figure 2: Distribution of women according to gestational age.

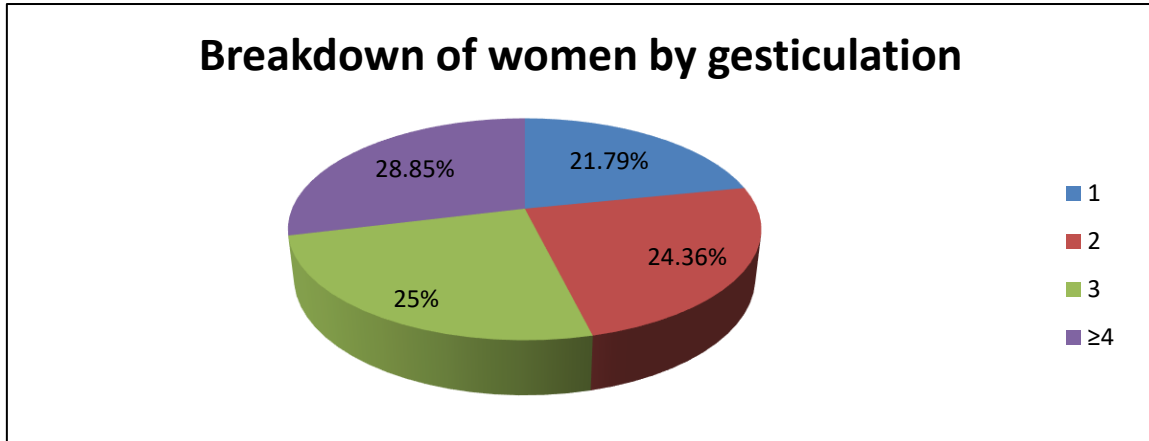


Figure 3: Distribution of women according to the number of gestures.

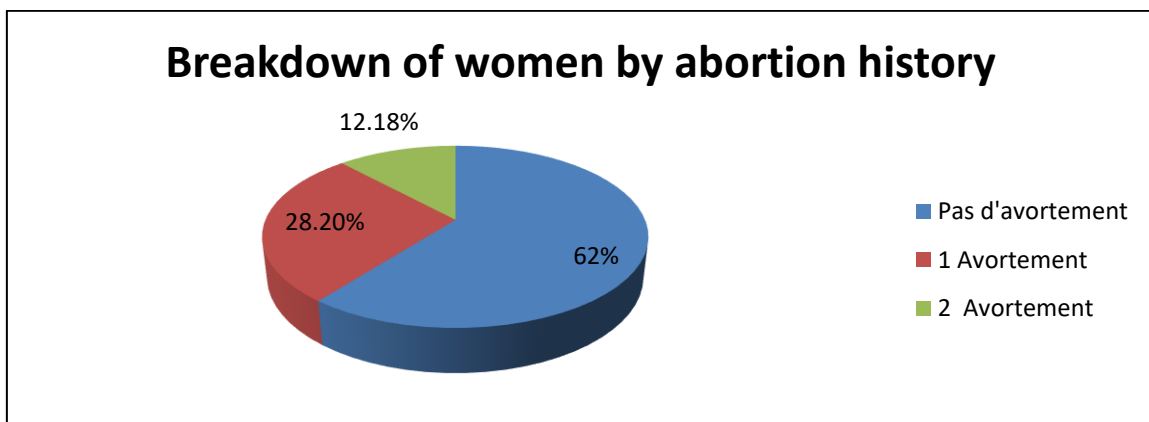


Figure 4: Distribution of women according to the number of abortions.

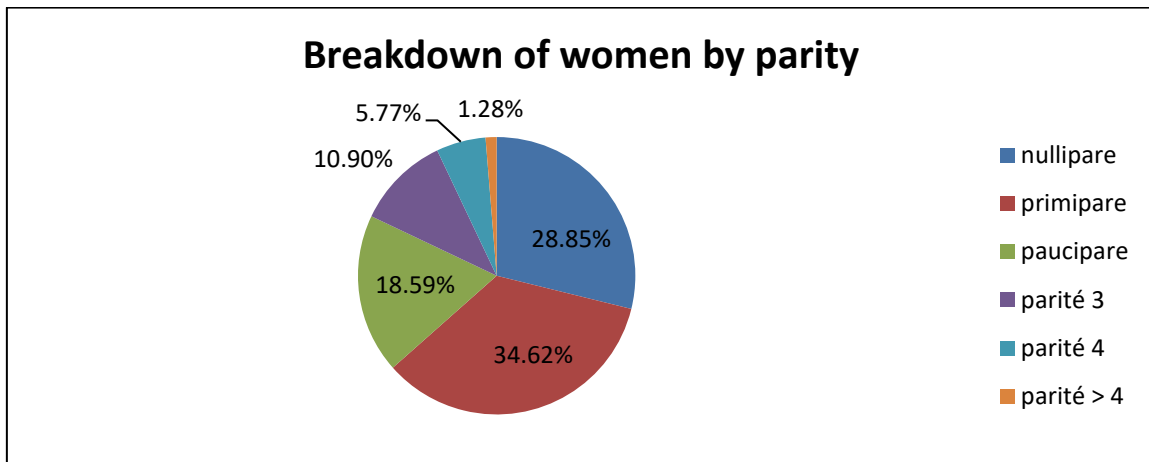


Figure 5: Distribution of women according to parity.

Table 1: Distribution of women according to their ABO-Rhesus groups.

Groups	Rhesus (-)	Rhesus (+)	Total
A	2 (1.28%)	31 (19.87%)	33 (21.15%)
B	4 (2.56%)	25 ((16.02%)	29 (18.59%)
O	10 (6.41%)	77 (49.36%)	87 (55.77%)
AB	0 (0%)	7 (4.49%)	7 (4.49%)
Total	16 (10.26%)	140 (89.74%)	156 (100%)

Table 2: Distribution of women according to RAI results.

RAI Population	Testing for Irregular Antibodies in the maternity ward of the Mènonin Zone Hospital	
	No.	%
Total women studied	156	100%
Number of women sensitized (Rh+ and Rh- combined)	0	00%
Number of non-sensitized women (Rh+ and Rh- combined)	156	100%

Table 3: Distribution of pregnant women received at the maternity ward for CPN1, VAT2, ultrasound.

	Number	%
CPN1	125	80
VAT2	122	78
Ultrasound	149	95

Table 1 presents the distribution of women according to their ABO-Rhesus groups. We note that the predominant blood group in the study population is group O, i.e., a percentage of 55.77%. Moreover, 89.74% of its women are Rhesus positive. Table 2 shows the distribution of women according to the RAI results. No woman in our study produced irregular antibodies.

DISCUSSION

Fetal-maternal Rhesus D alloimmunization is an immunological condition when a pregnant Rhesus negative (Rh-) woman is exposed to Rhesus positive (Rh+) red blood cells from her fetus. However, although there is much progress in the monitoring of pregnant women, fetomaternal alloimmunization remains a topical, severe, and persistent topic. The present study carried out on 156 pregnant women in the maternity ward of the Mènonin Zone Hospital reveals that the average age of the women is 27 years, the most represented age group is [25-30] (i.e., 30.13%), these women are mainly in the 3rd trimester of pregnancy, i.e., a percentage of 61.56%. This is due to the fact that this age group corresponds to high sexual activity, hence the high pregnancy rate. Our results are similar to those of Bigot A and Zohoun I (1994), who obtained the same age range. The age group of [15-20] represented only 3.85% of our study population. This low percentage can be explained by the national

reproductive health policy, which, through non-governmental organizations, raises awareness among young girls to dissuade them from having early pregnancies. In addition, expanded family planning programs have been extended to include young people, which was not the case before. It is also important to note that information and education on sexual and reproductive rights have become a reality in Benin, and courses promoting reproductive health are being introduced into teaching curricula at various levels.

Most women in our study period were primiparous, which corroborates the results of Yemadjro H. (2016) in the same hospital where the women were predominantly pauciparous. 62% of these women have never experienced an abortion (9). This result supports the introduction of reproductive health lessons into our educational programs and promoting family planning in our households. Thanks to this awareness raising, we are witnessing a reduction in cases of unwanted and unplanned pregnancies.

The ABO Rhesus blood grouping results tell us that 55.77% of the study population have blood group O. These confirm numerous other results, showing that this blood group is the most representative in Benin (0). 10.26% of these women are Rhesus negative, which could lead to fetal-maternal incompatibility in the Rhesus system if they carried Rhesus positive fetuses. However, the performance

of the Indirect Coombs test on these pregnant women was negative. These children would be exposed to a risk of fetomaternal alloimmunization, which could be fatal for them (4). Fortunately, the policy of systematic injection of anti-D to any Rh-negative pregnant woman who would have given birth to a Rh-positive child introduced in Benin has made it possible to remedy the consequences of fetomaternal alloimmunization. This reflects the absence of irregular antibodies in these women. These antibodies, which are IgG, could cross the placenta and destroy the fetal red blood cells until they are eliminated (11). Our results are contrary to those of Bigot A. and Zohoun I. in 1994, who found the prevalence of fetomaternal alloimmunization to be 4.75%. This difference could be explained by Bigot A. and Zohoun I.'s studies, conducted in the same country but in 1994, and ours in 2024. This again demonstrates the evolution of care Fetal-maternal incompatibilities among Rhesus-negative women in Benin.

Thus, fetomaternal incompatibility is an exciting topic in reproductive health today. Injecting anti-D gamma globulins into Rh-negative women is a prophylactic practice preventing the mother's immune system from producing antibodies against the Rh+ red blood cells of the fetus, thus avoiding severe complications such as hemolytic disease of the newborn. Indeed, administering anti-D immunoglobulins (Ig anti-D) is an essential intervention in obstetrics and hematology to prevent Rh alloimmunization in Rh-negative (Rh-) women and treat certain conditions involving Rh incompatibilities. This precaution is necessary in preventing hemolytic disease of the newborn (HDN), a severe condition that can occur when maternal antibodies attack fetal red blood cells. Ig anti-D is primarily administered in two contexts: prenatal prophylaxis and situations at risk of alloimmunization. Thus, healthcare professionals must ensure the correct identification of Rh-women and their rigorous follow-up during pregnancy. This includes blood group and indirect Coombs tests to detect potential alloimmunization.

The administration of Ig anti-D must adhere to established protocols, with doses adjusted according to the clinical situation. Providers must inform patients about the benefits, potential risks, and possible side effects, such as local reactions at the injection site or, more rarely, systemic reactions. Anti-D immunoglobulin significantly reduces the risk of sensitization and thus protects future pregnancies. This simple and effective intervention has transformed the management of Rh-incompatible pregnancies, significantly improving maternal and fetal outcomes. The present study, which was carried out in the maternity ward and completed in the laboratory of the Mènantin Zone Hospital is a study which confirms the importance and effectiveness of the injection of anti-D gamma globulins to Rhesus negative women because no woman has not developed irregular antibodies, which means that the search for irregular antibodies in these pregnant women is negative and this also reflects the know-how of current midwives, nurses and nurses in Benin in the era of universalization of paramedical training.

CONCLUSION

In conclusion, this study underscores the significance of systematic monitoring of pregnant women to prevent complications associated with fetomaternal alloimmunization. Conducted among 156 pregnant women at the Mènantin Zone Hospital, it highlighted that most participants were first-time parents with a predominant blood group of O+. Importantly, no cases of irregular antibodies were detected, emphasizing the effectiveness of preventive measures, particularly the systematic administration of anti-D gamma globulins to Rh-negative women. These findings reinforce the critical role of antenatal care in safeguarding maternal and fetal health and highlight the need for continued efforts to ensure comprehensive diagnostic and preventive practices in prenatal settings. This study not only contributes valuable data to the understanding of fetomaternal

immunological interactions but also supports the importance of implementing targeted strategies to mitigate risks associated with alloimmunization in pregnancy.

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