

ORIGINAL RESEARCH

Obstetrics

## Prevalence of Rhesus D negativity and barriers to immunoprophylaxis among obstetric patients in Kitengela Sub-county Hospital: A cross-sectional study

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Received: 22 December 2023; Revised: Accepted: 27 May 2024; Available online: June 2024

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### Abstract

**Background:** Rhesus (Rh) alloimmunization is a serious but preventable disease that develops in women who are Rh(D)-negative. This disease contributes significantly to perinatal morbidity and mortality. Prevalence data of Rh(D)-negative blood type among pregnant women in Kenya are scarce. This study aimed to determine the prevalence of Rh(D)-negative blood type, barriers to immunoprophylaxis, and ABO blood type patterns among the obstetric population in Kitengela Subcounty Hospital, Kajiado, Kenya.

**Methods:** A cross-sectional study design was employed in which medical records of Rh-negative women as documented at the first antenatal visit were retrieved. Data were collected, extracted into a data collection tool, and analyzed using the Statistical Package for Social Scientists Software (SPSS version 23).

**Results:** Of the 7141 women screened, 1.2 % (85) were Rh-negative. Among these, blood group O was

the most common (48.2%), followed by blood groups B (24.7%), A (23.5%), and AB (3.5%). Most Rh-negative women (45.9%) were aged 15-23 years. Following delivery, only half of the women received anti-D immunoglobulin. Among those who did not receive anti-D postnatally, 80.8% lacked a documented reason, whereas 12.2% and 4.9% of the patients lacked access and did not know their Rh status, respectively. None of these patients had fetal blood grouping conducted before anti-D administration.

**Conclusion:** Rh(D) negativity remains prevalent in the Kenyan population. However, access restrictions at both diagnostic and therapeutic levels remain. In addition, there is an overt hiatus in neonatal blood grouping.

**Keywords:** ABO, anti-D, immunoprophylaxis, Kitengela, Rhesus alloimmunization

### Introduction

The Rhesus (Rh) factor is an antigen located on the surface of the human red blood cell membrane, that was named after the rhesus monkey in which it was first discovered (1,2). The ABO and Rh systems are the

most clinically significant antigens on the red blood cell membrane. Despite the existence of multiple antigenic Rh subtypes, the D antigen is the most immunogenic and therefore the most common instigator of Rh incompatibility. Rhesus incompatibility occurs in

the setting of fetal-maternal hemorrhage in a Rh-negative mother who is pregnant with a Rh-positive baby. Upon exposure to Rh, the mother may form antibodies against the Rh antigen, resulting in Rh(D) sensitization (3). Once produced, maternal Rh immunoglobulin G (IgG) antibodies persist for life. They cross freely through the placenta to the fetal circulation, where they attack the Rh antigen in the fetus, resulting in fetal alloimmune hemolytic anemia (4). In its most severe form, this condition results in hemolytic disease of the newborn, a significant contributor to perinatal morbidity and mortality (5).

Alloimmunization occurs following sensitizing events. The context of sensitizing events broadly spans fetomaternal bleeding, injection with needles contaminated with Rh(D)-positive blood, inadvertent transfusion of Rh(D)-positive blood, and Rh(D) mismatched allogeneic hemopoietic stem cell transplantation (6,7). During pregnancy, fetomaternal hemorrhage typically occurs in events that compromise the integrity of the fetoplacental unit, including early pregnancy bleeding, antepartum hemorrhage, ectopic pregnancy, invasive prenatal diagnostic procedures, external cephalic version, intrauterine fetal demise, closed abdominal trauma, and intrauterine interventions and delivery. The use of anti-D immunoglobulin reduces Rh immunization from 16% of all Rh-negative women to 0.3% (8,9). It should be given after every sensitizing event, at 28 weeks of gestation, and postnatally within 72 hours after delivery of a Rh-positive fetus, unless already sensitized (10).

The prevalence of Rh(D) negativity varies in different populations, with Basques (30-35%), White North Americans and Europeans (15%), African Americans (8%), Africans (4-6%), and Chinese (0.3%) (11). However, the prevalence has not been determined in Kenya. Additionally, in Kenya, significant challenges exist, including failure to disclose previous abortions to avoid stigmatization and ostracization, inability to attend antenatal clinics due to restricted access, hiatuses in patient and provider knowledge on the risks of Rh(D) isoimmunization, poor medical record keeping, and prohibitive cost of anti-D immunoglobulin. These challenges may contribute to the morbidity and mortality associated with local Rh isoimmunization. Furthermore, testing for fetomaternal hemorrhage is not readily available, which may lead to the administration of suboptimal doses of anti-D immunoglobulin. This finding is congruent with the general situation observed in Sub-Saharan Africa, further concretizing the inference of an urgent need for the implementation of universal access to anti-D immunoglobulin to all Rh D-negative pregnant women (12). This study aimed to determine the prevalence of Rh(D)-negative blood type, barriers to immunoprophylaxis, and ABO blood type patterns among obstetric patients in Kitengela Subcounty Hospital, Kajiado County, Kenya.

## Methods

### Study design

This was a cross-sectional study in which medical records of Rh-negative women as documented at the first antenatal visit were retrieved. Information on anti-D immunoglobulin administration, maternal ABO status, fetal blood group testing before administration of postnatal anti-D, and barriers to anti-D administration were recorded in a data collection tool.

### Study setting

The study was conducted at the labor ward of Kajiado Subcounty Hospital in Kajiado County, Kenya. The hospital is a level 4 hospital serving Kajiado, Machakos, and Nairobi counties. The hospital conducts approximately 450 deliveries per month. The Obstetrics department is managed by an obstetrician, medical officers, and midwives. Routinely, all attending pregnant women undergo basic antenatal profile tests, including ABO and Rh blood groups.

### Study population

This study included records of all Rh-negative women who delivered at the Kitengela Subcounty Hospital between October 2021 and December 2022. Complete records were included in the study.

### Sample size calculation and sampling procedure

A sample size of 86 was calculated using Fischer et al.'s formula (13) based on a 5.4% prevalence of Rh(D)-negative blood type among the obstetric population in Ogbomoso, Southwestern Nigeria (14). A sample survey of 60 files for patients with Rh-negative blood group who were seen at the maternity unit was performed. Files satisfying the inclusion criteria were used to extract data using the data collection tool.

### Data collection and management

Two research assistants were trained on data collection to retrieve all patient files with a Rh-negative diagnosis. Relevant data from the files were extracted into the data collection tool. The principal investigator ascertained the accuracy and completeness of the extracted data. Thereafter, the data were transcribed into a password-protected Excel Spreadsheet and exported.

### Data quality assurance procedures

Medical research assistants trained on the data collection process. The confidentiality of the data extracted from the files was maintained by codifying the questionnaires and deidentifying the collected data. Duplication of data was avoided by physically separating the already sampled files. The accuracy of the data capture tool was checked by the principal investigator.

The accuracy of the extracted data was ascertained before transcription into the Excel Spreadsheet, and each transcribed record was reviewed according to the codification system used to minimize transcription errors.

### Data analysis

Data were exported to the Statistical Package for Social Scientists Software for analysis (SPSS version 23) (IBM Corp., Armonk, NY, USA). Sociodemographic characteristics were analyzed and presented in frequency tables. Univariate analysis for the sociodemographic and clinical characteristics was performed and presented in frequency tables. The prevalence of Rh-negative blood type was presented as a percentage.

### Ethical considerations

Ethical approval for this study was obtained from the Kenyatta University Ethics and Review Committee (registration number PKU/2691/11814). Patient confidentiality was maintained. The data used were deidentified. Because this was a retrospective study of medical records, informed patient consent was not required.

### Results

During the study period, 7141 were retrieved, of whom 85 (1.2 %) had Rh-negative blood group. Blood group O was found to be the most common, (41, 48.2%), while AB was the least common (3, 3.5%) (Table 1).

**Table 1:** ABO blood group distribution among Rh-negative participants delivered at Kitengela Subcounty Hospital between October 2021 and December 2022

ABO Blood Group	Frequency (n)	Percentage (%)
O	41	48.2
B	21	24.7
A	20	23.5
AB	3	3.5
Total	85	100.0

The age range was 15-41 years. Most women were between 15 and 23 years old, 45.9% (n=39), followed by 42.4% (n=36) were between 24 and 32 years old. Teenage pregnancies accounted for 10.6% (n=9) of the study population (Table 2).

**Table 2:** Age distribution of Rh-negative parturients delivered at Kitengela Subcounty Hospital between October 2021 and December 2022

Age group	Frequency (n)	Percent (%)
15-23	39	45.9
24-32	36	42.4
33-41	10	11.8
Total	85	100

Of all Rh-negative women, only half received anti-D postnatally. Among those who failed to receive anti-D postnatally, no reason was documented for 33 (80.5%), while 5 (12.2%), 2 (4.9%), and 1 (2.4%) were unable to buy, did not know their Rh status, and anti-D was out of stock, respectively. None of the patients had fetal blood grouping and Rh typing performed before maternal anti-D administration (Table 3).

**Table 3:** Postnatal anti-D administration among the Rh-negative parturients delivered at Kitengela Subcounty Hospital between October 2021 and December 2022

Postnatal anti-D Administration	Frequency	Overall percent (%)	Stratified percent (%)
Administered	44	51.8	N/A
Not administered:	41	48.2	N/A
No reason documented	33	38.8	80.5
Unable to buy	5	5.9	12.2
Did not know her rhesus status	2	2.4	4.9
Anti-D out of stock	1	1.2	2.4
Total	85	100	100

### Discussion

In this study, Rh negativity was reported in 1.2% of the study population. Since there were no systemic biasing factors, such as being a teaching and referral hospital, it is reasonable to infer the potential for significant external validity of this result among the Kenyan population. Additionally, teenage pregnancies were found to be very common in this population. A similar trend was observed in Ethiopia (15). Among the Rh-negative, blood group O was the most common, while AB was the rarest. This result corroborated a similar trend in Ethiopia (15,16).

Half of the women in this study received postnatal anti-D therapy. Although this is significantly higher than that reported in Ethiopia (2), it is still unacceptably low. Equally unacceptable is the fact that financial constraints are still prevalent even though Rh disease and its stigmata are technically fully preventable. It was noted that some participants had their Rh status determined and documented, yet they remained unaware of their status or the availability of preventive treatment. This resulted in a paradoxical missed opportunity that may present as Rh disease in later gestations; hence, predisposing these subjects to adverse obstetric outcomes. In addition, unacceptable was the observed missed opportunities due to stock-outs of anti-D. These findings contrasted with those observed in Ethiopia, where the failure of anti-D administration was due to low antenatal clinic and skilled birth attendances (2). These findings highlight a need to address the knowledge hiatus among women through counseling and health education during antenatal care visits (17).

In this study, fetal blood grouping and Rh typing were not conducted before anti-D administration for all the 85 Rh-negative participants. Coincidentally, a similar trend was observed in Germany, a high-income country, as recently as 2020 (18). This is in contravention of the recommendation by the British Committee for Standards in Haematology (BCSH) that postnatal fetal blood grouping and Rh typing should be performed on cord blood, with maternal administration of at least 1500 international units of anti-D within 72 hours of delivery being predicated upon the results (19).

The main strength of this study is that it provides an extrapolatable estimate of the actual prevalence of Rh negativity in the obstetric population of Kenya. However, the use of this estimate should be informed by the fact that it may have been influenced by limitations in access by patients due to cost and the influence of the coronavirus disease 2019 pandemic, which significantly modified the health-seeking behaviors of patients globally. Additionally, the prevalence of Rh negativity among the obstetric population may not be directly extrapolatable to the overall population in Kenya.

## Conclusion

Rh(D) negativity remains prevalent in the Kenyan population. However, access restrictions at both diagnostic and therapeutic levels remain. In addition, there is an overt hiatus in neonatal blood grouping. We recommend counseling and health education for pregnant women, universal screening and documentation of maternal Rh status, and improved access to anti-D prophylaxis antenatally and postnatally. There is also a need to undertake nationwide blood grouping studies to determine the actual prevalence of Rh negativity in Kenya.

## Conflicts of Interest

The authors declare no conflicts of interest.

## Funding

None

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