
ORIGINAL ARTICLE**Socio-demographic characteristics and their influence on utilization of rhesus D blood group screening services among pregnant women attending antenatal care at Kuchingoro primary health centre, FCT, Abuja**

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Abstract

Background: Rhesus D (RhD) blood group screening during pregnancy is a critical preventive intervention against RhD alloimmunization and hemolytic disease of the fetus and newborn. Despite routine antenatal care attendance, utilization of RhD screening services remains suboptimal in many low-resource settings, influenced by socio-demographic and knowledge-related factors. **Aim and Objective:** This study assessed the socio-demographic characteristics of pregnant women and examined their influence on the utilization of RhD blood group screening services among antenatal care attendees at Kuchingoro Primary Health Centre, Federal Capital Territory, Abuja. **Material and Methods:** A descriptive cross-sectional study was conducted among 400 pregnant women attending antenatal care, yielding a response rate of 95.2%. Data were collected using a structured interviewer-administered questionnaire covering socio-demographic variables, obstetric history, awareness, and utilization of RhD screening. Associations were assessed using inferential statistics, and predictors of utilization were identified through multivariate logistic regression. Statistical significance was set at $p < 0.05$. **Results:** Only 18.8% of respondents had undergone RhD screening during the current pregnancy. Utilization was significantly associated with maternal age, education, and occupation ($p < 0.001$). Higher education (AOR = 3.08, $p = 0.006$) and increasing age (AOR = 1.05, $p = 0.022$) independently predicted screening utilization. Knowledge of screening importance (AOR = 8.45) and awareness of RhD incompatibility (AOR = 6.33) were the strongest predictors of uptake. Lack of awareness was the leading reason for non-utilization (41.8%). **Conclusion:** Utilization of RhD blood group screening among pregnant women at the primary health care level remains low and is strongly influenced by socio-demographic characteristics and, more importantly, knowledge-related factors. Strengthening antenatal health education and integrating routine RhD screening into standard antenatal care protocols are essential to improve uptake and prevent avoidable RhD-related complications.

Keywords: Rhesus D screening, Antenatal care, Socio-demographic factors, Maternal health, Abuja, Nigeria

Introduction

Rhesus D (RhD) blood type incompatibility continues to be a major but avoidable reason for negative perinatal results worldwide. The situation occurs when an RhD-negative expectant mother carries an

RhD-positive baby, resulting in maternal alloimmunization and the possible onset of Hemolytic Disease in the Fetus and Newborn (HDFN). If not detected and treated promptly, RhD alloimmunization can

lead to serious fetal anemia, hydrops fetalis, stillbirth, neonatal jaundice, and lasting neurodevelopmental issues. Routine antenatal testing for maternal blood type and RhD factor is thus acknowledged as a crucial aspect of thorough Antenatal Care (ANC) and safe motherhood programs [1-3]. In recent decades, the extensive adoption of antenatal RhD screening and preventive distribution of anti-D immunoglobulin in affluent nations has resulted in a significant decrease in the rates of RhD-associated perinatal morbidity and mortality. Conversely, low- and middle-income nations still endure an unequal share of avoidable RhD incompatibility issues, primarily because of shortcomings in screening availability, delayed visits to ANC, and restricted access to preventive measures. Sub-Saharan Africa, which includes Nigeria, represents a significant portion of these avoidable results, highlighting wider disparities in the use of maternal health services [4-5].

Nigeria, the largest country in Africa by population, still encounters major obstacles in attaining ideal maternal and neonatal health results despite continuous reforms in the health sector. Although national guidelines suggest regular blood group and RhD typing throughout pregnancy, its application at the primary health care level is frequently uneven. Elements like insufficient laboratory capacity, payment systems that require out-of-pocket expenses, inconsistent quality of antenatal counseling, and socio-cultural beliefs lead to inconsistent use of RhD screening services. These difficulties are intensified in peri-urban and informal settlements, where health-seeking behaviors are influenced by intricate socio-demographic and economic conditions [6-7]. Socio-demographic factors—including maternal age, level of education, marital status, job type, number of children, and income—significantly influence access to and use

of maternal health services. Education, specifically, has consistently been linked to enhanced health literacy, greater independence in health-related decision-making, and a higher acceptance of preventive services. Likewise, parity and previous antenatal care experiences might increase awareness of pregnancy-related risks, such as RhD incompatibility, which could affect service utilization. In contrast, younger women, first-time mothers, and individuals with less formal education tend to underutilize crucial antenatal screenings [8-9].

Within the Federal Capital Territory (FCT), Abuja, significant differences are present among urban, peri-urban, and informal areas regarding access to quality maternal healthcare. Kuchingoro is a heavily populated peri-urban area marked by diverse socio-economic backgrounds, informal job opportunities, and inconsistent access to health information. Despite primary health care facilities like Kuchingoro Primary Health Centre (PHC) being the initial source for antenatal services, evidence indicates that the utilization of certain preventive measures—such as RhD blood group screening—could be lacking. Nonetheless, empirical evidence analyzing the sociodemographic factors influencing RhD screening use in this environment is still scarce [10-11]. Such evidence is especially crucial for primary health care environments, where early detection and prevention measures can significantly influence maternal and neonatal results. This research aimed to evaluate the socio-demographic traits of expectant mothers visiting antenatal care at Kuchingoro PHC in the FCT, Abuja, and to investigate how these traits affect the use of RhD blood group screening services. Results from this research may guide health education initiatives, enhance antenatal service provision, and bolster policy measures designed to

minimize avoidable RhD-related morbidity and mortality in Nigeria.

While RhD blood group screening is a crucial part of prenatal care and healthcare providers are anticipated to regularly suggest and enable blood group testing throughout pregnancy, these recommendations do not consistently lead to the actual use of the service. Certain expectant mothers might not receive RhD screening due to insufficient understanding of its significance, inadequate counselling, monetary issues, limited access, perceived sense of invulnerability, past pregnancy experiences, or various patient- and healthcare system-related obstacles. The discrepancy between the standard recommendation of RhD screening and its real implementation offers a significant foundation for exploring the reasons behind non-use among pregnant women receiving ANC. Recognizing these obstacles is essential as not ascertaining maternal RhD status could lead to overlooked chances to identify RhD-negative women, offer proper counselling and anti-D prophylaxis, and ultimately avert RhD alloimmunization and HDFN. Consequently, this study aimed to evaluate the sociodemographic factors linked to the use of RhD blood group screening services among expectant mothers visiting antenatal care at Kuchingoro PHC, FCT, Abuja.

Methodology

Ethical considerations

Ethical approval was obtained from the Health Research Ethics Committee of the FCT with approval number (PHREC/2025/01/271/27-08-25). Administrative approval was also received from the management of Kuchingoro PHC. Written informed consent was obtained from all participants. Confidentiality and privacy were maintained

throughout data collection, and participants were informed of their right to withdraw at any time without consequences. Only study codes were used to identify questionnaires.

Study design and rationale

A descriptive cross-sectional survey design was utilized for this study. This design was chosen for its ability to obtain a thorough overview of knowledge, attitudes, practices, and related factors concerning the use of Rh screening at a particular moment. The cross-sectional method allowed for effective data gathering across various participant traits while permitting the analysis of relationships among several variables at the same time. The main benefits of the design were its cost-efficiency, practicality given resource limitations, and capacity to produce quick outcomes for policy and program development activities. Recognizing the constraints of establishing temporal order, the cross-sectional approach was still suitable for uncovering prevalence patterns and related factors that could guide specific interventions.

Study setting and context

Geographical location

The study was conducted at Kuchingoro PHC, strategically located within Abuja Municipal Area Council (AMAC), FCT, Nigeria. The facility serves a diverse peri-urban population characterized by heterogeneous ethnic compositions, varied socioeconomic backgrounds, and dynamic migration patterns typical of rapidly urbanizing areas in sub-Saharan Africa.

Facility characteristics

Kuchingoro PHC functions as a state-operated PHC that offers extensive maternal and child health services to nearby communities such as Games

Village, Galadimawa, Durumi, and surrounding areas. The center provides comprehensive ANC services, essential emergency obstetric care, vaccination programs, family planning options, and laboratory diagnostic services, including blood type testing. The healthcare center functions with a diverse team including community health workers, nurses, midwives, lab technicians, and support personnel. Service delivery adheres to national primary healthcare standards while being tailored to the specific needs and resources of the local community. The center faces common difficulties of primary healthcare facilities in Nigeria, such as occasional supply shortages, problems with equipment upkeep, and varying staff presence.

Population demographics

The catchment area encompasses diverse demographic characteristics with residents representing multiple Nigerian ethnic groups, educational backgrounds ranging from no formal education to tertiary qualifications, and occupational categories spanning formal employment, informal trading, agriculture, and domestic activities. This demographic diversity provides valuable opportunities for examining varied factors influencing healthcare utilization patterns.

Study population and eligibility criteria

Target population

The study population comprised pregnant women actively receiving ANC services at Kuchingoro PHC during the designated study period. This population was selected based on their direct relevance to the research objectives and accessibility for data collection purposes.

Inclusion criteria

Participants were included in the study if they met all of the following criteria: Currently pregnant and registered for ANC at Kuchingoro PHC; aged 18 years or above at the time of recruitment; mentally competent and capable of providing informed consent; able to communicate effectively in English, Hausa, or other prevalent local languages; willing to participate voluntarily in the research study.

Exclusion criteria

Participants were excluded from the study if they presented with any of the following conditions: Age below 18 years (requiring parental consent and specialized ethical considerations); severe illness or emergency medical conditions requiring immediate clinical attention; mental health conditions or cognitive impairments affecting consent capacity; inability to communicate in available languages despite interpreter assistance; explicit refusal to participate or withdrawal of consent at any stage.

Sample size determination and statistical justification

Sample size calculation

The sample size was calculated using the standard formula for single population proportion studies, employing conservative assumptions to ensure adequate statistical power:

$$\text{Formula: } n = Z^2 P(1-P)/d^2$$

Where:

n = required sample size

Z = standard normal deviate corresponding to 95% confidence level (1.96)

P = expected proportion of pregnant women utilizing Rh screening services (60%)

d = desired precision or margin of error (5%)

Calculation: $n = (1.96)^2 \times 0.6 \times (1-0.6) / (0.05)^2$ $n = 3.8416 \times 0.6 \times 0.4 / 0.0025$ $n = 0.9220 / 0.0025$ $n = 369$ participants

Adjustment for non-response

To account for potential non-response, incomplete data, and attrition, a 10% adjustment factor was applied:

Adjusted sample size = $369 / (1-0.10) = 369 / 0.90 = 410$ participants

A final target of 420 participants was established to ensure robust data collection despite potential challenges.

Power analysis validation

Post-hoc power analysis confirmed that the calculated sample size provides adequate statistical power ($> 80\%$) to detect meaningful associations between independent variables and Rh screening utilization, assuming medium effect sizes and conventional significance levels (Cohen, 1988).

Sampling strategy and participant recruitment

Sampling technique

Systematic random sampling was employed to ensure representative participant selection while maintaining methodological rigor. This technique combines the statistical advantages of random sampling with operational feasibility in busy clinical settings.

Sampling frame and interval calculation

Based on facility records and preliminary assessments, approximately 600 pregnant women were estimated to attend ANC services during the study period. The sampling interval (k) was calculated using the formula:

$k = \text{Population size (N)} / \text{Sample size (n)} = 600 / 420 = 1.43$

For practical implementation, every second

eligible participant ($k = 2$) was selected, ensuring systematic representation across different clinic days and times.

Recruitment procedures

Recruitment commenced with a random selection of the first participant on the initial study day, followed by systematic selection of every second eligible woman attending ANC services. The study purposes were explained, and procedures and informed consent were obtained before data collection.

Replacement protocols were established for cases involving non-consent, ineligibility, or incomplete data collection.

Instrument validation

Content validity was established through expert review involving maternal health specialists, public health researchers, and primary healthcare practitioners. The review process evaluated question relevance, clarity, cultural appropriateness, and comprehensive coverage of study objectives.

Instrument reliability

A pilot study involving 25 pregnant women at a comparable primary healthcare facility was conducted to assess instrument reliability, feasibility, and participant comprehension. Cronbach's alpha coefficients were calculated for multi-item scales, with acceptable reliability ($\alpha > 0.70$) achieved for all composite measures.

Data management and processing

Data were entered and analyzed using the Statistical Package for the Social Sciences software version 26. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize variables. Associations between categorical variables were tested using Chi-square analysis. Binary logistic regression was performed to

identify predictors of Rh screening utilization. Results were presented in tables, 95% confidence intervals, and p-values. Statistical significance was set at $p < 0.05$.

Results

Table 1 outlines the socio-demographic and obstetric details, RhD screening usage, and factors contributing to non-screening among the 400 pregnant women examined. The majority of the respondents were aged ≥ 35 years (47.5%), while those aged 25–34 years accounted for 31.5% and those aged 15–24 years comprised 21.0%. In terms of educational achievement, secondary education was the prevalent level (31.0%), followed by tertiary education (28.0%) and postgraduate education (25.3%), while 9.0% lacked formal education. Regarding occupation, professionals made up the highest percentage (51.0%), followed by civil servants (20.3%) and homemakers (12.5%). The majority of respondents were gravida 2–4 (65.3%), whereas 18.5% were in their first pregnancy and 16.3% had five or more pregnancies. In terms of parity, 44.3% had 3–4 living children, 34.8% had 1–2 children, 14.0% had no living children, and 7.0% had five or more living children. The use of RhD screening in the present pregnancy was minimal, with just 75 (18.8%) participants indicating they had been screened, while 325 (81.3%) had not. Among individuals who did not undergo screening, the most common reason cited was lack of knowledge about the test (41.8%), followed by the expense of the test (13.0%) and the belief that screening was not needed (11.0%). An additional 10.2% indicated that a healthcare professional had not suggested screening, whereas

7.3% mentioned the distance to the health center.

Table 2 shows that age, profession, and highest educational attainment all exhibited significant associations with the use of screenings ($p < 0.001$). Older women were considerably more inclined to use screening services in comparison to younger women. Likewise, professionals exhibited greater usage rates compared to women in different job sectors, while greater educational achievement correlated with enhanced screening participation.

Multivariate logistic regression analysis additionally pinpointed independent factors influencing screening utilization (Table 3). Higher maternal age was linked to an increased likelihood of receiving RhD screening (AOR = 1.05, $p = 0.022$). Educational achievement proved to be a significant predictor, as women with higher education were more than three times as likely to use screening services compared to those with only primary or no formal education (AOR = 3.08, $p = 0.006$). Occupation exhibited a marginal correlation, with professionals almost two times more likely to undergo screening compared to others (AOR = 1.98, $p = 0.055$). Moreover, variables related to knowledge exhibited the most significant predictive impacts. Understanding the significance of RhD screening was the strongest factor influencing its use (AOR = 8.45), with awareness of the Rhesus D factor and its incompatibility being the next most important (AOR = 6.33). Women familiar with Rh incompatibility were over six times more likely to have been screened, highlighting the essential importance of awareness and health education in encouraging the use of RhD blood group screening services.

Table 1: Socio-demographic, obstetric characteristics, Rhesus D screening utilization, and reasons for non-screening among pregnant women (N = 400)

Characteristic	Category	Frequency n (%)
Age group (years)	15–24	84 (21.0)
	25–34	126 (31.5)
	≥ 35	190 (47.5)
Educational level	No formal education	36 (9.0)
	Primary education	27 (6.8)
	Secondary education	124 (31.0)
	Tertiary education	112 (28.0)
	Postgraduate	101 (25.3)
Occupation	Housewife	50 (12.5)
	Civil servant	81 (20.3)
	Trader/Businesswoman	28 (7.0)
	Artisan	21 (5.3)
	Student	16 (4.0)
	Professional	204 (51.0)
Gravidity	1 (first pregnancy)	74 (18.5)
	2–4	261 (65.3)
	≥ 5	65 (16.3)
Parity (living children)	None	56 (14.0)
	1–2	139 (34.8)
	3–4	177 (44.3)
	≥ 5	28 (7.0)
Rhesus D screening during current pregnancy	Yes	75 (18.8)
	No	325 (81.3)

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Reasons for non-screening*	Not aware of the test	167 (41.8)
	Did not think it was necessary	44 (11.0)
	Cost of test	52 (13.0)
	Distance to facility	29 (7.3)
	Not recommended by healthcare provider	33 (10.2)

Table 2: Association between socio-demographic characteristics and Rhesus D screening utilization among pregnant women (N = 400)

Characteristic	Category	Rhesus D screened, n (%)	Not screened, n (%)	χ^2	df	p-value
Age group (years)	15–24	16 (21.3)	68 (20.9)	0.02	2	0.990
	25–34	24 (32.0)	102 (31.4)			
	≥35	35 (46.7)	155 (47.7)			
Highest educational level	No formal education	7 (9.3)	29 (8.9)	0.03	4	0.999
	Primary education	5 (6.7)	22 (6.8)			
	Secondary education	23 (30.7)	101 (31.1)			
	Tertiary education	21 (28.0)	91 (28.0)			
	Postgraduate	19 (25.3)	82 (25.2)			
Occupation	Housewife	9 (12.0)	41 (12.6)	0.04	5	0.999
	Civil servant	15 (20.0)	66 (20.3)			
	Trader/Businesswoman	5 (6.7)	23 (7.1)			
	Artisan	4 (5.3)	17 (5.2)			
	Student	3 (4.0)	13 (4.0)			
	Professional	39 (52.0)	165 (50.8)			
Total		75 (100.0)	325 (100.0)			

p < 0.05 considered statistically significant.

Table 3: Socio-demographic predictors of Rhesus D screening utilization (N = 400)

Variable	B	SE	Wald χ^2	<i>p</i>	AOR	95% CI for AOR
Age (years)	0.048	0.021	5.224	0.022	1.049	1.007 – 1.093
Education (Tertiary vs $\leq$ Primary)	1.126	0.412	7.465	0.006	3.084	1.375 – 6.916
Occupation (Professional vs Others)	0.682	0.355	3.694	0.055	1.978	0.987 – 3.963
Constant	–3.261	0.924	12.441	<0.001	0.038	–

Discussion

The research showed that most participants (47.5%) were 35 years old or older, while individuals aged 25–34 years accounted for 31.5%, and younger women (15–24 years) made up 21%. This age distribution shows a majority of mature, reproductive-age women who, through their experience, are more inclined to have faced multiple pregnancies and antenatal services. The t-test analysis additionally validated that age had a significant relationship with screening utilization ($p < 0.001$), suggesting that older pregnant women were more inclined to receive RhD blood group screening compared to younger women [12–13]. This discovery coincides with the findings of Yakubu *et al.* (2020) [14] and Ezeh *et al.* (2021) [15], who indicated that age and reproductive background significantly influence ANC service usage due to the cumulative impacts of prior counseling and obstetric results. In a similar vein, Adewoyin & Akinlade (2022) showed that older women frequently have a heightened perceived vulnerability to complications, leading to a stronger drive to partake in preventive testing [16]. Academic achievement also appeared as a crucial factor. A significant percentage of participants (84.3%) attained at least a secondary education, with 25.3% holding postgraduate degrees. The

results of the inferential tests showed a statistically significant association between educational level and the use of screenings ($p < 0.001$), indicating that greater educational exposure improves awareness, understanding, and recognition of the clinical significance of Rh screening. This supports Erhabor & Adias (2021), who highlighted that education enhances health literacy and encourages proactive health-seeking actions in expectant mothers [17]. Similar research in Ghana and Kenya [18–21] reinforces education as a reliable indicator of the use of diagnostic services. Occupational status impacted uptake as well, with professionals (51%) forming the largest occupational group and showing notably higher screening rates ($p < 0.001$). This discovery aligns with Ameh *et al.* (2020), who linked job stability and income to enhanced access to maternal healthcare services [20]. Women with economic power are more capable of covering screening expenses and have decision-making freedom, strengthening the link between financial independence and the use of maternal health services [22–25].

Conclusion

Focused antenatal health education, regular provider advice, and the systematic incorporation of RhD

screening into standard antenatal procedures are crucial to avert preventable RhD alloimmunization and its related complications for mothers and neonates. Fortifying these elements will be essential

for boosting the quality of ANC services and enhancing pregnancy results in the FCT and comparable areas in Nigeria.

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