Healthcare Studies, 4(2):1–14, 2026. DOI: 10.58612/hs421

Healthcare Studies

ISSN (Online): 2583-9802

Journal homepage: https://fpub.org/journal-details.php?journal-id=42

Research Article

Knowledge, Attitude, and Perception of Women of Reproductive Age Towards Rhesus Factor Incompatibility Screening in Port Harcourt Local Government Area, Rivers State, Nigeria

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Article Info

Keywords: *Rhesus Factor Incompatibility, Knowledge, Attitude, Perception, Women of Reproductive Age, Nigeria.*

Received: *05.06.2026;*
Accepted: *28.06.2026;*
Published: *04.07.2026*

Abstract

Background: Rhesus (Rh) factor incompatibility is a significant cause of hemolytic disease of the newborn, leading to fetal morbidity and mortality if not identified and prevented. The aim of this study was to assess the knowledge, attitude, and perception of women of reproductive age towards Rh factor incompatibility screening in Port Harcourt Local Government Area (PHALGA), Rivers State, Nigeria.
Methods: A cross-sectional study was conducted among 422 women aged 15–49 years. Data were collected using structured questionnaires and analyzed using SPSS v27. Knowledge, attitude, and perception scores were computed and categorized. Chi-square tests examined associations between KAP and sociodemographic factors. Statistical significance was set at $p < 0.05$.
Results: The majority of participants aged 35–39 years (24.2%). Most participants were married (70.6%), Christian (96.2%), and had completed secondary (49.8%) or tertiary education (35.1%). Traders constituted the largest occupational group (60.7%), with nearly half (47.9%) earning $\leq$ ₦70,000 monthly. Overall, 62.6% of respondents demonstrated poor knowledge of Rh incompatibility screening, with 37.4% showing good knowledge. Attitudes were overwhelmingly positive, with 96.7% demonstrating favorable disposition towards screening, while perception of health risks was also high (97.4% good perception). Health workers (39.3%) and antenatal clinics/health talks (33.6%) were the main sources of information. Knowledge and perception were significantly associated with educational attainment, occupation, income, and health decision-making patterns ($p < 0.05$).
Conclusion: Women in PHALGA show high awareness and positive attitudes toward Rh incompatibility screening, but knowledge gaps remain in specific areas, including partner Rh status and preventive strategies like Anti-D prophylaxis. Socioeconomic and decision-making factors influence knowledge levels. Targeted health education, structured antenatal counseling, and promotion of joint health decision-making are recommended to improve screening and uptake of preventive measures.

1. Introduction

The Rhesus (Rh) factor was described as a genetically inherited protein antigen, specifically the D antigen, located on the surface of human red blood cells. Individuals whose erythrocytes expressed this antigen were classified as Rh-positive, whereas those who lacked it were

How To Cite: B.A. Ibuchim-Owabie, K.G. McFubara and A.I. Wegbom. Knowledge, Attitude, and Perception of Women of Reproductive Age Towards Rhesus Factor Incompatibility Screening in Port Harcourt Local Government Area, Rivers State, Nigeria. *Healthcare Studies*, 4(2):1–14, 2026. https://doi.org/10.58612/hs421

Rh-negative [1, 2]. The expression of the Rh factor was primarily determined by the presence or absence of the *RHD* gene on chromosome 1, which encoded the RhD protein responsible for antigen expression [2, 3]. Although this genetic variation was physiologically harmless under normal conditions, it became clinically significant during pregnancy when an Rh-negative woman carried an Rh-positive fetus inherited from an Rh-positive father. In such cases, fetal red blood cells entering the maternal circulation could trigger maternal immune sensitization and subsequent production of anti-D antibodies [1]. Rhesus factor incompatibility remained an important but preventable cause of adverse pregnancy outcomes, particularly in low- and middle-income countries. When maternal sensitization occurred, anti-D antibodies produced by the mother could cross the placenta in subsequent pregnancies and destroy fetal red blood cells, resulting in hemolytic disease of the fetus and newborn (HDFN) [4]. This condition was associated with severe complications such as fetal anemia, neonatal jaundice, hydrops fetalis, kernicterus, and intrauterine or neonatal death. Despite the availability of effective preventive strategies, the burden of HDFN remained high in many developing countries, including Nigeria, where access to comprehensive antenatal care services was often limited [5]. The prevention of Rh alloimmunization had been well established through routine antenatal screening and timely administration of anti-D immunoglobulin to Rh-negative pregnant women. International guidelines, including those from the World Health Organization, recommended universal screening for blood group and Rh status during pregnancy, as well as prophylactic anti-D administration at appropriate gestational periods and after delivery of an Rh-positive infant [6–8]. However, in Nigeria, implementation of these recommendations remained inconsistent due to factors such as inadequate antenatal coverage, high cost and limited availability of anti-D immunoglobulin, and broader systemic health system challenges [7, 8]. Evidence from previous studies in Nigeria indicated substantial gaps in awareness and utilization of Rh incompatibility preventive measures among women of reproductive age. For instance, a study conducted in Irrua demonstrated that although many women were aware of blood group testing, only a small proportion had knowledge of the Rh factor, and more than half had never heard of anti-D immunoglobulin [9]. Furthermore, misconceptions regarding the necessity of Rh testing were prevalent, suggesting that general awareness of blood grouping did not necessarily translate into adequate knowledge or appropriate preventive practices.In Port Harcourt Local Government Area (PHALGA) of Rivers State, the situation reflected a complex interaction of healthcare access, socio-economic factors, and cultural beliefs. Despite the presence of tertiary and secondary health facilities, many women continued to seek care from primary health centers and traditional birth attendants, where Rh screening and preventive interventions were not consistently available [10]. Additionally, cultural misconceptions, financial constraints, and limited health literacy contributed to poor uptake of antenatal services, including Rh incompatibility screening [11]. These factors created missed opportunities for early detection and prevention of Rh sensitization. Nigeria's relatively high fertility rate, estimated at approximately 4.8 births per woman, further amplified the public health significance of Rh incompatibility [12, 13]. With increasing parity, the likelihood of maternal sensitization and adverse outcomes in subsequent pregnancies increased, particularly in the absence of adequate prophylaxis. This underscored the need for sustained and effective preventive measures across successive pregnancies. Knowledge, attitude, and perception were identified as critical determinants of health-seeking behavior and utilization of maternal healthcare services. Adequate knowledge of Rh incompatibility, positive attitudes toward screening, and appropriate perception of risk were essential for promoting timely uptake of preventive interventions. Conversely, poor knowledge, negative attitudes, and misconceptions could hinder the utilization of available services, thereby increasing the risk of preventable complications [4]. Despite ongoing efforts to improve maternal and child health, Nigeria continued to experience high maternal and neonatal mortality rates, with many deaths attributable to preventable causes [6]. Rh incompatibility, although largely preventable, remained a contributing factor in settings where awareness and access to preventive services were inadequate. Furthermore, evidence from Nigerian tertiary health institutions indicated inconsistencies in the screening and management of Rh-negative pregnancies, highlighting systemic gaps in service delivery [14]. Similar findings in other African settings also demonstrated that younger and primigravid women remained particularly vulnerable to Rh incompatibility due to limited awareness and delayed antenatal care initiation [15]. Given these challenges, there was a need for context-specific evidence to guide interventions aimed at improving maternal knowledge and promoting preventive practices. In PHALGA, where diverse socio-cultural and healthcare factors intersected, understanding women's knowledge, attitudes, and perceptions toward Rh incompatibility screening was crucial for designing effective health education and service delivery strategies. Therefore, this study assessed the knowledge, attitude, and perception of women of reproductive age towards Rhesus factor incompatibility screening in Port Harcourt Local Government Area, Rivers State, Nigeria. The findings provided baseline data for policy formulation, targeted interventions, and improved maternal healthcare practices aimed at reducing the incidence of HDFN and associated adverse.

2. Methods

2.1. Study Design and Setting

A cross-sectional survey was conducted among women of reproductive age in Port Harcourt Local Government Area (PHALGA), Rivers State, to assess knowledge, attitudes, and perceptions toward Rhesus factor incompatibility screening. Port Harcourt, the state capital, is a highly urbanized and densely populated area with an estimated population of 1,865,000 in 2023 [16]. It comprises diverse ethnic groups, including Ikwerre, Ijaw, and Ogoni, where socio-cultural factors may influence maternal health knowledge and practices [17, 18]. Located in the Niger Delta region (4.7677°N, 7.0189°E), PHALGA is a major economic and transportation hub, with key infrastructure such as the Port Harcourt International Airport and the University of Port Harcourt supporting healthcare access and research [19, 20]. The area has numerous public and private health facilities, including primary healthcare centres and diagnostic laboratories, providing antenatal care and Rhesus factor screening services [21].The oil-driven economy and growing middle class have improved healthcare access and influenced health-seeking behaviours, including increased uptake of antenatal screening [22–25]. Additionally, cultural events and public health campaigns contribute to awareness and shape women's attitudes toward preventive practices such as Rhesus incompatibility screening [21, 26].

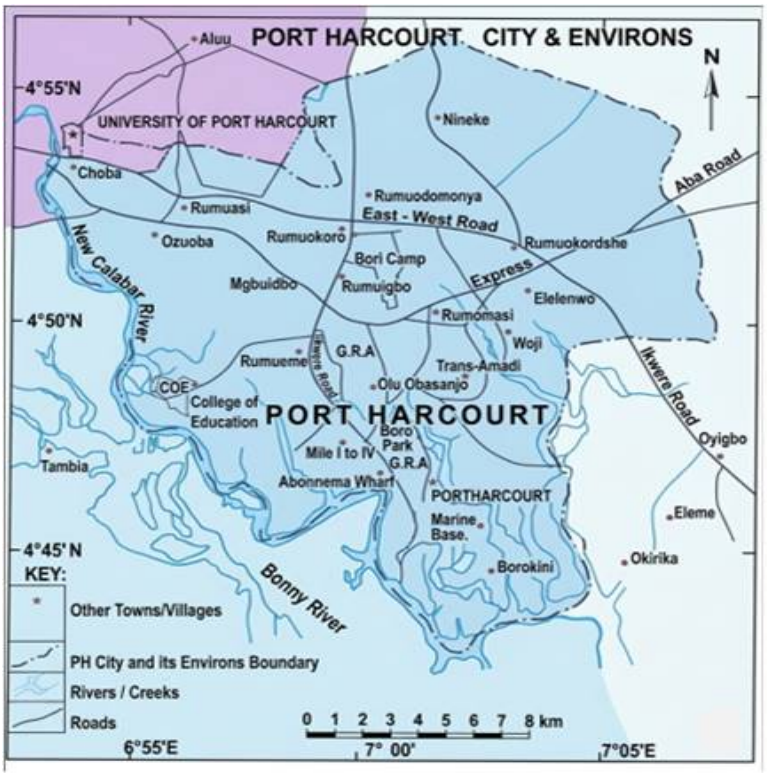

Figure 1: Map of Port Harcourt City (Source: Google Map)

2.2. Inclusion and Exclusion Criteria

Women of reproductive age (15–49 years) residing in Port Harcourt Local Government Area at the time of the study, Women who have experienced pregnancy at least once or are currently pregnant, Women who consent to participate in the study by signing or verbally agreeing to the informed consent form and Women who are mentally and physically capable of responding to the questionnaire and engaging in the data collection process were included in the study while Women who have difficulty of communication (hearing problems) and who were severely ill during data collection were excluded.

2.3. Questionnaire

Structured interviewer guide administered questionnaires assessed sociodemographic characteristics, knowledge of Rh incompatibility, attitudes towards screening, perception of health risks. A five-point Likert scale ranging from strongly agree to strongly disagree measured respondents' attitude and perception. The questionnaire was developed through expert review of relevant literature, it was divided into four sections. Section A captured respondents' socio-demographic characteristics, Section B assessed their level of knowledge of Rhesus factor incompatibility and its prevention, Section C assessed Attitude Toward Rhesus Factor Screening and Preventive Measures while Section D assessed Perception of Health Risks and Preventive Importance. To minimize misinterpretation of questions and enhance the accuracy of responses, the instrument was administered by trained interviewers. Content and construct validity were ensured through expert review by three public health specialists and Cronbach's Alpha (CA) test of reliability was calculated as 0.80.

2.4. Data Collection Procedure

Data were collected using a structured, interviewer-administered questionnaire. Trained fieldworkers conducted household visits over two weeks, supervised by coordinators to ensure protocol adherence. A pilot test was conducted in a similar community before full deployment. Informed consent was obtained from all participants.

2.5. Statistical Analysis

Data were coded and analyzed using SPSS version 27 (IBM Corp., 2020). Descriptive statistics of frequency and percentages summarized sociodemographic and KAP variables. Knowledge of Rhesus factor incompatibility was assessed using a composite score generated from 17 items. Each correct response was scored "1" and incorrect or "do not know" responses scored "0," yielding a total score of 0–17. Using the mean score of 8.24 as the cut-off, participants were classified as having Poor Knowledge (score <8.24) or Good Knowledge (score ≥ 8.24) [27, 28]. Attitude and perception were assessed using composite scores generated from 5-point Likert scale items. Using the mean scores as cut-offs, participants with attitude scores ≥ 20.47 were classified as having a Positive Attitude, while those with scores <20.47 were considered to have a Negative Attitude. Similarly, participants with perception scores ≥ 28.17 were classified as having a Good Perception, whereas scores <28.17 indicated a Poor Perception [29–31]. Cross-tabulation examined associations between KAP and sociodemographic variables, applying 95% CIs to determine significance [32–34]. Chi-square tests tested hypotheses of association. Statistical significance was set at $p < 0.05$. Results were presented in tables and figures for clarity.

2.6. Ethical Consideration

Ethical approval was granted by the Ethical Review Committee, Faculty of Basic Medical Sciences, and Rivers State University (Approval No: Number: RSU/FBMS/REC/25/406). Written informed consent was obtained. Participation was voluntary, and all data were kept confidential and used strictly for research purposes.

3. Results

3.1. Sociodemographic Characteristics

The result of the sociodemographic characteristics shown in Table 1. The largest proportion (24.2%) was aged 35–39 years, followed by 30–34 years (18.2%) and 25–29 years (16.4%). Most participants were married (70.6%), Christian (96.2%), and had secondary (49.8%) or tertiary education (35.1%). Traders formed the largest occupational group (60.7%), followed by civil/public servants (19.0%). Nearly half of respondents earned $\leq$ ₦70,000 monthly (47.9%). Joint decision-making on health matters was reported by 40.0%, while 29.9% made decisions independently.

Table 1: Distribution of Sociodemographic Characteristics of Women of Reproductive Years in PHALGA, Rivers State, Nigeria n=422

Variables	Number (n)	Percentage (%)
Respondents' Age (years)		
15-24	55	13.0
25-29	69	16.4
30-34	77	18.2
35-39	102	24.2
40-44	62	14.7
45- 49	57	13.5
Marital Status		
Married	298	70.6
Unmarried	88	20.9
Divorced/Separated	13	3.1
Widow	23	5.5
Religion		
Christian	406	96.2
Muslim	10	2.4
Other (Traditional Worshipper)	6	1.4
Highest Level of Education		
No formal education	18	4.3
Primary	46	10.9
Secondary	210	49.8
Tertiary	148	35.1
Occupation		
Civil/Public Servant	80	19.0
Trader	256	60.7
Farmer	17	4.0
Student	41	9.7
Housewife	12	2.8
Unemployed	16	3.8
Monthly Income (Naira)		
$\leq$70,000	202	47.9
71,000-100,000	82	19.4
101,000-150,000	36	8.5
151,000-200,000	41	9.7
$>$200,000	61	14.5
Major Health Decision Maker		
Woman alone	126	29.9
Husband/partner	99	23.5
Joint decision	169	40.0
Others	28	6.6

3.2. Knowledge of Rhesus Factor Incompatibility Screening

Table 2 shows high awareness of general blood grouping but lower knowledge of Rhesus factor–specific issues and prevention. Most respondents had heard of blood grouping 400 (94.8%), knew their blood group 344 (81.5%), and received early counselling 309 (73.2%); these items loaded strongly on Component 3 (0.801, 0.772, 0.579), indicating a cluster of general knowledge. Knowledge of Rhesus factor was lower: 178 (42.2%) had heard of it, 129 (30.6%) knew their status, 132 (31.3%) received counselling, 191 (45.3%) knew their partner's

blood group, and 101 (23.9%) knew their partner's Rhesus status. These items loaded on Component 2 (0.540–0.805), reflecting moderate awareness with notable gaps. Knowledge of causes, risks, and prevention was poorest and formed Component 1. Only 120 (28.4%) knew the cause, 78 (18.5%) knew when it occurs, 55 (13.0%) linked it to repeated abortions, 53 (12.6%) to premature labour, and 110 (26.1%) to miscarriage/stillbirth. Regarding prevention, 139 (32.9%) knew it is preventable, 99 (23.5%) had heard of Anti-D, 114 (27.0%) knew its use, and 87 (20.6%) knew the correct timing; these items showed strong loadings (mostly >0.70), indicating a distinct preventive knowledge domain. Overall, 264 respondents (62.6%) had poor knowledge, while 158 (37.4%) had good knowledge, highlighting significant gaps, particularly in Rhesus-specific and preventive knowledge.

Table 2: Distribution of Knowledge Level of Women of Reproductive Age for Rhesus Factor Incompatibility Screening

Variables	**N**	**(%)**	**Principal Component Loading**	**Component**
Heard about blood grouping (Yes)	400	94.8	0.801	3
Knows her blood group (Yes)	344	81.5	0.772	3
Early Counselling on blood group (Yes)	309	73.2	0.579	3
Heard about Rhesus factor (Yes)	178	42.2	0.698	2
Knows her Rhesus factor (Yes)	129	30.6	0.754	2
Early Counselling on Rh incompatibility(Yes)	132	31.3	0.743	2
Knows Husband's/Partners blood group(Yes)	191	45.3	0.54	2
Knows Husband/Partners Rhesus factor(Yes)	101	23.9	0.805	2
Knew Cause of Rh incompatibility (Mother/Father/Baby (all valid)	120	28.4	0.752	1
Knew when Rh incompatibility occurs (Baby Rh+ & Mother Rh–)	78	18.5	0.775	1
Knows that Previous Repeated abortion leads to Rh issue (Yes)	55	13.0	0.651	1
Knows that Premature labour leads to Rh issue (Yes)	53	12.6	0.623	1
Knows that Rh incompatibility causes stillbirth and Miscarriage (Yes)	110	26.1	0.761	1
Knows that Rh Factor incompatibility can be prevented (Yes)	139	32.9	0.807	1
Heard About Anti-D, Given to Rhesus Negative Women Married to Rhesus +Ve Men to Prevent Pregnancy Complications?	99	23.5	0.729	1
Knows what to be taken to prevent Rh Factor incompatibility (Anti-D)	114	27.0	0.775	1
Knew When to take Anti-D (Within 72 hrs. after delivery if baby is Rh+)	87	20.6	0.718	1

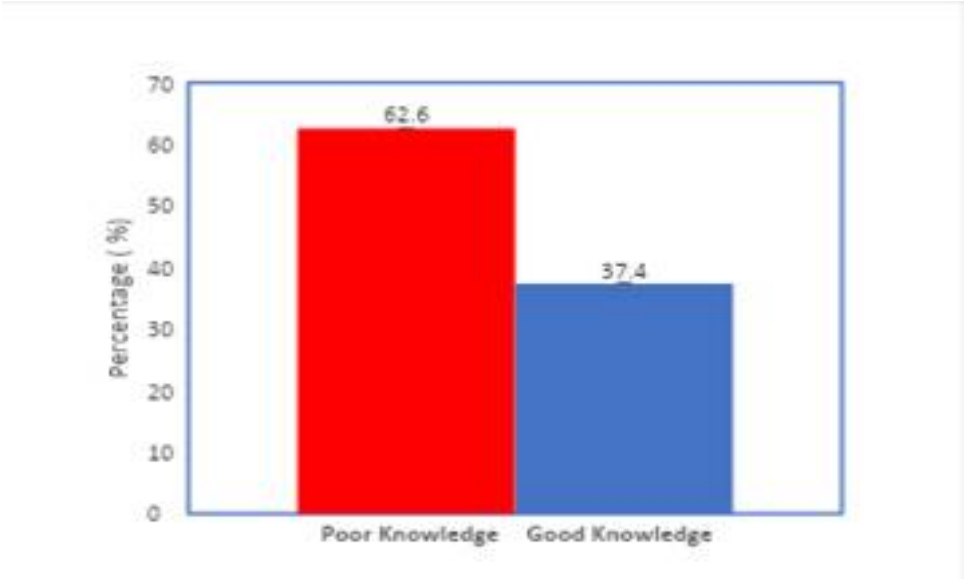

Figure 2: Knowledge Level regarding Rhesus factor Incompatibility Screening

3.3. Sources of Information

Figure 3 illustrates the main sources from which respondents obtained information about the Rhesus factor. The results show that health workers were the most frequently reported source of information, cited by 39.3% of the respondents. This was followed by antenatal clinics or health talks, mentioned by 33.6%, reflecting the important role of maternal health services in disseminating information on Rhesus compatibility. A substantial proportion of participants (35.3%) indicated that they did not know their source of information on the Rhesus factor, suggesting notable gaps in structured communication on the subject. Other reported sources included family and friends at 10.7%, mass media at 10.2%, and social media/internet, which accounted for 15.2%, demonstrating that interpersonal and digital platforms also play secondary roles. Less commonly reported sources were school or educational programs, cited by 5.0%, and religious or community meetings, reported by 6.4% of respondents. These findings indicate that while formal healthcare settings dominate as the primary source of Rhesus factor information, informal and community channels contribute marginally.

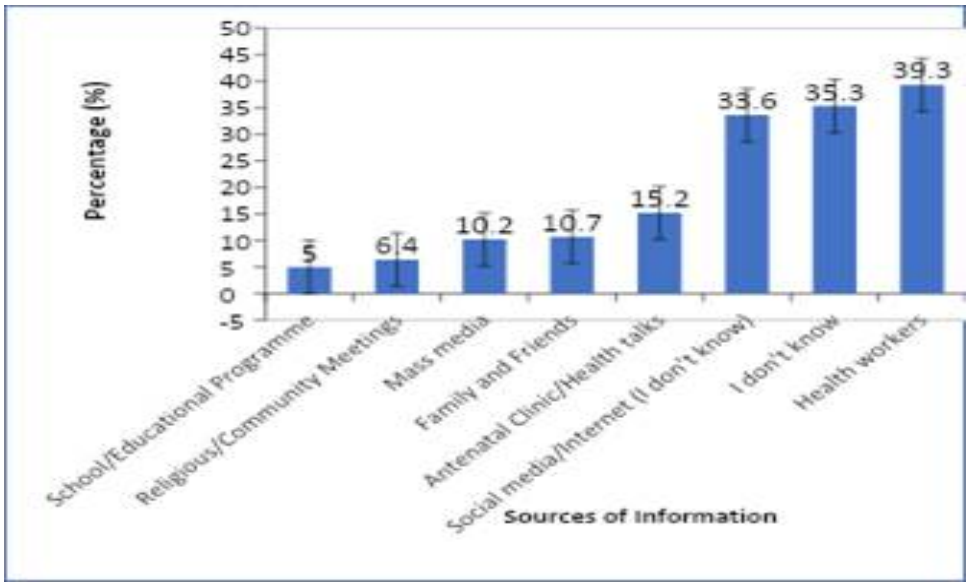

Figure 3: Sources of information about Rhesus factor

3.4. Attitude towards Rhesus factor Incompatibility Screening

Table 3 indicates generally positive attitudes toward Rhesus incompatibility screening, though some uncertainty and misconceptions persist. Most respondents supported genotype and Rhesus testing before and during pregnancy, with 244 (57.8%) agreeing and 107 (25.4%) strongly agreeing, while few disagreed and 47 (11.1%) were neutral. Similarly, 185 (43.8%) agreed and 57 (13.5%) strongly agreed with maternal–foetal compatibility testing, although 163 (38.6%) were neutral. Fear or reluctance toward testing showed mixed responses, with 217 (51.4%) neutral, 114 (27.0%) agreeing, and 40 (9.5%) strongly agreeing, indicating some apprehension. Communication with partners was low, as 269 (63.7%) were neutral, and only 99 (23.4%) agreed/strongly agreed. Trust in healthcare providers was high, with 182 (43.1%) agreeing and 122 (28.9%) strongly agreeing to seek care from professionals. Belief in prayer or traditional methods was generally low, as 113 (26.8%) disagreed and 85 (20.1%) strongly disagreed, though 186 (44.1%) were neutral. Overall, 408 respondents (96.7%) demonstrated a positive attitude, while 14 (3.3%) had a negative attitude, indicating widespread acceptance of Rhesus screening despite some uncertainty.

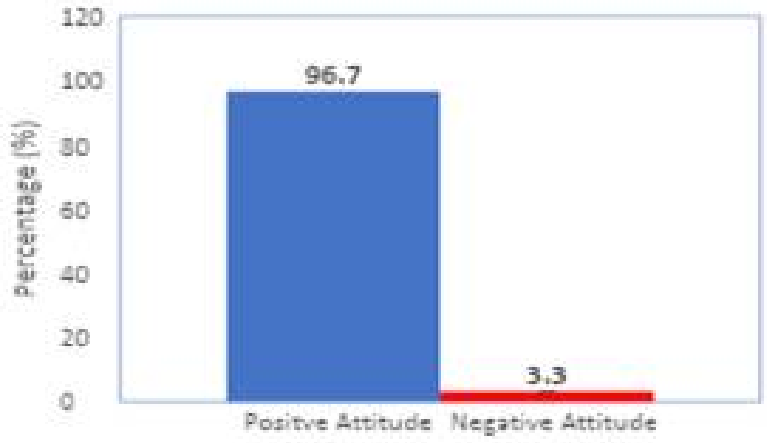

Figure 4: Attitude Level towards Rhesus Factor Incompatibility screening

Table 3: Attitude of Women of Reproductive Age PHALGA Towards Rhesus Factor Screening (n=422)

Attitude variables	n	(%)
It is important to carry out genotype and rhesus incompatibility test before childbearing and during pregnancy.		
Strongly Disagree	18	4.3
Disagree	6	1.4
Neutral	47	11.1
Agree	244	57.8
Strongly Agree	107	25.4
All women should do maternal-fetal compatibility test when recommended, especially during pregnancy.		
Strongly Disagree	1	3.6
Disagree	2	0.5
Neutral	1	38.6
Agree	1	43.8
Strongly Agree	5	13.5
I am scared and reluctant about doing a rhesus incompatibility test because I am afraid to be Rhesus negative.		
Strongly Disagree	25	5.9
Disagree	26	6.2
Neutral	217	51.4
Agree	114	27.0
Strongly Agree	40	9.5
I really care about my rhesus factor. I discuss with my partner about maternal-foetal incompatibility.	18	4.3
Strongly Disagree	36	8.5
Disagree	269	63.7
Neutral	60	14.2
Agree	39	9.2
Strongly Agree		
If there is incompatibility, I will prefer to get treatment from the doctor or certified healthcare givers.		
Strongly Disagree	16	3.8
Disagree	1	0.2
Neutral	101	23.9
Agree	182	43.1
Strongly Agree	122	28.9
Prayer or traditional methods are the best ways to tackle rhesus incompatibility as it may be caused by evil forces.		
Strongly Disagree	85	20.1
Disagree	113	26.8
Neutral	186	44.1
Agree	30	7.1
Strongly Agree	8	1.9

3.5. Perception About Health Risk of Rhesus Incompatibility

Table 4 presents the perceptions level of women of reproductive age regarding the health risks associated with Rhesus (Rh) incompatibility and its prevention. The results show that although many respondents acknowledge the risks and preventive strategies associated with Rh incompatibility, a large proportion remain uncertain about several key aspects. Regarding awareness of the severity of Rh incompatibility, more than half of the respondents (240; 56.9%) were undecided about whether Rh incompatibility can cause serious health risks for the mother and baby. However, 123 women (29.1%) agreed and 50 (11.8%) strongly agreed that it can cause serious health consequences. Only 7 respondents (1.7%) strongly disagreed and 2 (0.5%) disagreed, indicating minimal denial of the risks. Similarly, a majority (266 respondents; 63.0%) were undecided about whether babies affected by Rh incompatibility may suffer long-term health problems. Nevertheless, 93 respondents (22.0%) agreed and 43 (10.2%) strongly agreed with the statement, while only 9 (2.1%) strongly disagreed and 11 (2.6%) disagreed. Perception of the fatal risk associated with untreated Rh incompatibility followed a similar pattern. 247 women (58.5%) were undecided about whether untreated Rh incompatibility can lead to the death of the baby, whereas 122 (28.9%) agreed and 48 (11.4%) strongly agreed. Only 3 respondents (0.7%) strongly disagreed and 2 (0.5%) disagreed. With regard to the possibility of Rh incompatibility causing abortion or miscarriage, 267 women (63.3%) indicated they were undecided. Despite this, 66 respondents (15.6%) agreed and 60 (14.2%) strongly agreed that miscarriage is a potential consequence. A total of 10 respondents (2.4%) strongly disagreed and 19 (4.5%) disagreed. The perception that stillbirth is one of the effects of Rh incompatibility also showed high levels of uncertainty. 283 respondents (67.1%) were undecided, while 80 (19.0%) agreed and 40 (9.5%) strongly agreed. Only 9 respondents (2.1%) strongly disagreed and 10 (2.4%) disagreed. In terms of prevention, 209 women (49.5%) were undecided about whether complications of Rh incompatibility are preventable. However, 162 respondents (38.4%) agreed and 40 (9.5%) strongly agreed that complications can indeed be prevented. Only 9 (2.1%) strongly disagreed

and 2 (0.5%) disagreed. Perception about premarital screening showed stronger positivity. A majority of respondents (233; 55.2%) agreed and 89 (21.1%) strongly agreed that screening partners before marriage can prevent complications related to Rh incompatibility. Meanwhile, 84 respondents (19.9%) were undecided. Only 13 (3.1%) strongly disagreed and 3 (0.7%) disagreed. Similarly, a high level of confidence was expressed regarding medical management after diagnosis. 273 respondents (64.7%) agreed and 64 (15.2%) strongly agreed that adequate medical care can be provided during pregnancy if Rh incompatibility is diagnosed. 71 women (16.8%) were undecided, whereas only 13 (3.1%) strongly disagreed and 1 (0.2%) disagreed. The overall perception index Figure 5 shows a clearly positive trend: 411 respondents (97.4%) demonstrated a good perception of Rh incompatibility health risks and prevention, while only 11 respondents (2.6%) exhibited poor perception.

Table 4: Perception of Women of Reproductive Age About Health Risk of Rhesus Incompatibility

Variables	N	%
Rh incompatibility can cause serious health risks for mother and baby		
Strongly Disagree	7	1.7
Disagree	2	0.5
Undecided	240	56.9
Agree	123	29.1
Strongly Agree	50	11.8
Babies affected by Rh incompatibility may suffer long-term health problems		
Strongly Disagree	9	2.1
Disagree	11	2.6
Undecided	266	63
Agree	93	22
Strongly Agree	43	10.2
Rh incompatibility can lead to death of the baby if untreated		
Strongly Disagree	3	0.7
Disagree	2	0.5
Undecided	247	58.5
Agree	122	28.9
Strongly Agree	48	11.4
Rh incompatibility can cause abortion or miscarriage		
Strongly Disagree	10	2.4
Disagree	19	4.5
Undecided	267	63.3
Agree	66	15.6
Strongly Agree	60	14.2
Stillbirth is one of the effects of Rh incompatibility		
Strongly Disagree	9	2.1
Disagree	10	2.4
Undecided	283	67.1
Agree	80	19
Strongly Agree	40	9.5
Complications from Rh incompatibility are preventable		
Strongly Disagree	9	2.1
Disagree	2	0.5
Undecided	209	49.5
Agree	162	38.4
Strongly Agree	40	9.5
Screening partners before marriage can prevent complications		
Strongly Disagree	13	3.1
Disagree	3	0.7
Undecided	84	19.9
Agree	233	55.2
Strongly Agree	89	21.1
Adequate medical care can be provided during pregnancy if Rh incompatibility is diagnosed		
Strongly Disagree	13	3.1
Disagree	1	0.2
Undecided	71	16.8
Agree	273	64.7
Strongly Agree	64	15.2

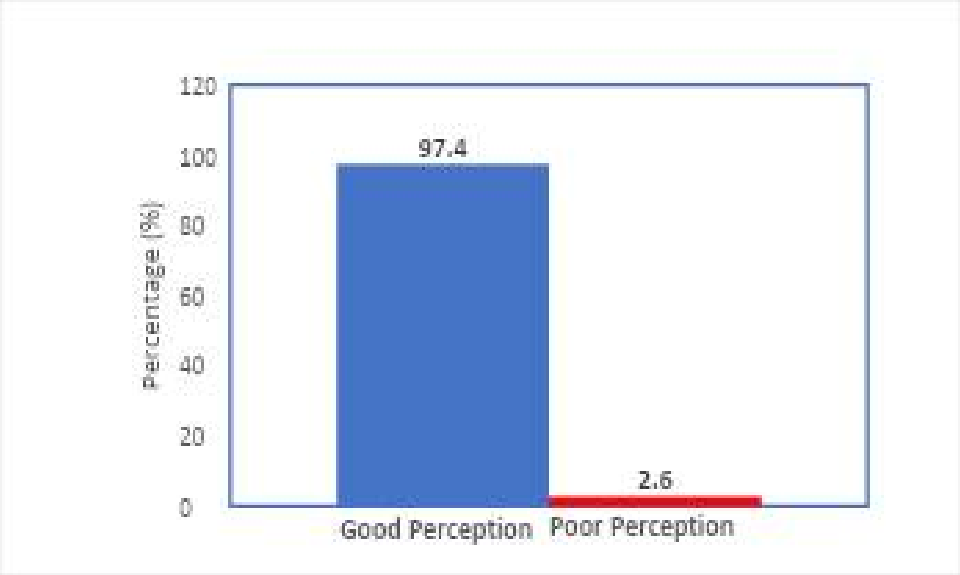

Figure 5: Perception Level About Health Risk of Rhesus Factor Incompatibility

Relationship between socio-demographic characteristics with knowledge, attitude, and perception of Rhesus factor Screening

Table 5 shows significant associations between several socio-demographic factors and respondents' knowledge, attitude, and perception of Rhesus factor screening. Age was significantly associated with knowledge (χ^2 = 20.561, p = 0.002) and attitude (χ^2 = 12.337, p = 0.006), with respondents aged 25–34 years showing higher good knowledge (32.9%), while those aged 45–49 years had the lowest (9.6%) but the highest positive attitude (100.0%). Age was not associated with perception (p = 0.145). Marital status was significantly associated with knowledge (χ^2 = 13.569, p = 0.035), with married women having higher good knowledge (27.5%), but showed no association with attitude or perception (p >0.05). Religion was not significantly associated with knowledge, attitude, or perception (p >0.05). Educational level was significantly associated with knowledge (χ^2 = 12.948, p = 0.044), with higher knowledge among those with tertiary education (29.7%), but not with attitude or perception. Occupation showed strong associations with knowledge (χ^2 = 44.624, p <0.001), attitude (χ^2 = 20.984, p = 0.001), and perception (χ^2 = 23.295, p <0.001), with variation across occupational groups. Monthly income was not associated with knowledge (p = 0.228) but was significantly associated with attitude (χ^2 = 23.144, p <0.001) and perception (χ^2 = 12.214, p = 0.016). Health decision-making authority was significantly associated with knowledge (χ^2 = 21.920, p = 0.005), but not with attitude or perception (p >0.05). Overall, knowledge varied significantly across several socio-demographic factors, while attitude and perception were generally positive and less influenced by these variables.

4. Discussion

The findings on the knowledge level of women of reproductive age towards Rhesus (Rh) factor incompatibility screening revealed a clear disparity between general awareness of blood grouping and specific understanding of Rh-related issues. The study demonstrated that while a substantial majority of respondents were aware of blood grouping, knew their blood group, and had received early counselling, knowledge of Rh factor, its causes, risks, and preventive strategies was markedly low. Less than half of the respondents had heard of the Rh factor, and even fewer knew their Rh status or that of their partners. Furthermore, knowledge of preventive measures such as Anti-D prophylaxis was particularly limited. Overall, the majority of respondents exhibited poor knowledge. This finding suggests that although general health information is relatively widespread, specialized reproductive health knowledge remained inadequate [35–37]. A plausible explanation for this pattern lies in the structure of health education delivery within many low- and middle-income settings, where emphasis is often placed on general antenatal topics rather than specific conditions such as Rh incompatibility. In addition, limited health literacy, inadequate counselling during antenatal visits, and low male partner involvement may have contributed to poor understanding of Rh-related issues [38–40]. The complexity of Rh incompatibility concepts may also hinder comprehension, particularly among women with lower educational attainment. These findings are consistent with studies conducted in Nigeria and similar contexts, which reported high awareness of blood grouping but insufficient knowledge of Rh incompatibility and its prevention [35, 36]. Similarly, Ofori et al. (2020) found low awareness of Rh incompatibility prevention among pregnant women in Ghana [37]. In contrast, studies conducted in high-income countries reported significantly higher levels of knowledge, likely due to stronger antenatal education systems and routine screening protocols [38]. From a theoretical perspective, the Health Belief Model provides a useful framework for interpreting these findings. The model posits that individuals are more likely to engage in preventive health behaviors when they possess adequate knowledge and perceive themselves to be at risk [39]. In this case, insufficient knowledge of Rh incompatibility may reduce perceived susceptibility and severity, thereby limiting the uptake of screening and preventive practices. Consequently, there is a need for policy interventions that strengthen targeted health education on Rh incompatibility. Integrating comprehensive Rh-related counselling into antenatal and preconception care, promoting partner involvement, and ensuring access to Anti-D prophylaxis are essential steps toward improving maternal and neonatal outcomes [40–42]. The findings on sources of information indicated that health workers and antenatal clinics were the primary channels through which women received information about Rh factor incompatibility, while a notable proportion of respondents could not identify their source of information. Other channels such as social media, family and friends, and mass media played relatively minor roles. This suggested that formal healthcare systems remained the dominant avenue for disseminating maternal health information, although gaps in communication persisted [43–45]. The inability of many respondents to identify their information source may indicate passive exposure to information or fragmented communication

Table 5: Relationship between socio-demographic with knowledge, attitude, and perception of Rhesus factor Screening

Variables	Knowledge (Good n, %)	χ^2	p-value	Attitude (Positive n, %)	χ^2	p-value	Perception (Good n, %)	χ^2	p-value
Age (years)		20.561	0.002		12.337	0.006		5.394	0.145
15-24	14 (26.4)			52 (98.1)			51 (96.2)		
25-34	49 (32.9)			138 (92.6)			142 (95.3)		
35-44	29 (21.2)			135 (98.5)			136 (99.3)		
45-49	8 (9.6)			83 (100.0)			82 (98.8)		
Marital status		13.569	0.035		2.002	0.572		1.194	0.754
Married	82 (27.5)			286 (96.0)			290 (97.3)		
Unmarried	16 (18.2)			86 (97.7)			85 (96.6)		
Divorced/Separated	2 (15.4)			13 (100.0)			13 (100.0)		
Widow	0 (0.0)			23 (100.0)			23 (100.0)		
Religion		7.071	0.132		0.571	0.752		0.445	0.800
Christian	100 (24.6)			392 (96.6)			395 (97.3)		
Muslim	0 (0.0)			10 (100.0)			10 (100.0)		
Traditional	0 (0.0)			6 (100.0)			6 (100.0)		
Education		12.948	0.044		0.574	0.902		1.786	0.618
No formal	4 (22.2)			17 (94.4)			18 (100.0)		
Primary	16 (34.8)			44 (95.7)			44 (95.7)		
Secondary	36 (17.1)			204 (97.1)			206 (98.1)		
Tertiary	44 (29.7)			143 (96.6)			143 (96.6)		
Occupation		44.624	<0.001		20.984	0.001		23.295	<0.001
Civil servant	33 (41.3)			71 (88.8)			72 (90.0)		
Trader	41 (16.0)			252 (98.4)			254 (99.2)		
Farmer	0 (0.0)			17 (100.0)			17 (100.0)		
Student	12 (29.3)			41 (100.0)			41 (100.0)		
Housewife	4 (33.3)			12 (100.0)			12 (100.0)		
Unemployed	10 (62.5)			15 (93.8)			15 (93.8)		
Monthly income (₦)		10.558	0.228		23.144	<0.001		12.214	0.016
$\leq$70,000	42 (20.8)			196 (97.0)			197 (97.5)		
71-100k	20 (24.4)			81 (98.8)			81 (98.8)		
101-150k	13 (36.1)			30 (83.3)			32 (88.9)		
151-200k	7 (17.1)			41 (100.0)			41 (100.0)		
$>$200k	18 (29.5)			60 (98.4)			60 (98.4)		
Health decision maker		21.920	0.005		5.911	0.206		5.970	0.201
Self	16 (12.7)			121 (96.0)			123 (97.6)		
Husband	32 (32.3)			99 (100.0)			99 (100.0)		
Joint	48 (28.4)			161 (95.3)			162 (95.9)		
Others	4 (13.3)			12 (92.3)			12 (92.3)		

strategies. This pattern can be explained by the central role of healthcare providers as trusted sources of information in maternal health contexts. However, limited utilization of alternative communication channels such as media and community platforms may restrict the reach of health messages. These findings align with previous studies in sub-Saharan Africa, which emphasized the importance of healthcare providers in health education [46, 47]. Conversely, research in developed settings shows greater reliance on digital platforms and structured prenatal education programs [48]. The Diffusion of Innovations Theory is relevant here, as it highlights the role of change agents, such as health workers, in spreading new health information [49]. However, the limited diversification of communication channels may hinder widespread adoption of Rh screening practices. Policy efforts should therefore focus on expanding health communication strategies to include media campaigns, school-based education, and community engagement initiatives [50, 51]. The findings on attitude toward Rh incompatibility screening revealed overwhelmingly positive attitudes among respondents, with most women supporting screening before and during pregnancy and expressing trust in healthcare professionals. Despite this generally positive outlook, a considerable proportion of respondents expressed neutrality regarding certain aspects, such as fear of testing and communication with partners. This indicated that while women may conceptually support screening, uncertainties and social barriers may influence their actual behavior [52–54]. The observed positive attitudes may be attributed to increased awareness of maternal health services and trust in formal healthcare systems. However, persistent neutrality and apprehension could have stemmed from inadequate knowledge, fear of stigmatization, or cultural norms that limited open discussion of reproductive health issues. These findings are consistent with studies conducted in Nigeria, which reported positive attitudes toward maternal health services despite gaps in knowledge [35, 37]. However, they contrasted with findings from settings with higher health literacy, where attitudes were often more decisive and strongly aligned with preventive behaviors [38]. The Theory of Planned Behavior provides insight into this phenomenon, suggesting that positive attitudes alone are insufficient to drive behavior unless accompanied by supportive social norms and perceived behavioral control [40, 55]. Therefore, policy interventions should focus not only on sustaining positive attitudes but also on addressing barriers to action, such as fear and limited partner communication, through counselling and community-based programs [56, 57]. The perception of women regarding the health risks of Rh incompatibility presented an interesting paradox. Although the overall perception was categorized as good, a large proportion of respondents were undecided about critical aspects such as the severity of the condition, its long-term consequences, and its potential to cause miscarriage or stillbirth. At the same time,

many respondents expressed confidence in preventive measures and medical management. This suggested that while general awareness existed, detailed understanding of risks remained limited [58–60]. This pattern may be explained by superficial knowledge that does not translate into deep comprehension of health risks. Women may have heard about Rh incompatibility but lacked sufficient information to form strong perceptions about its consequences. Similar findings have been reported in other studies, where high levels of perceived awareness coexisted with knowledge gaps [61]. In contrast, studies conducted in high-income countries demonstrated stronger and more accurate risk perception, often linked to higher levels of education and access to information [62]. The Health Belief Model again provides a useful lens, as it emphasizes the importance of perceived severity and susceptibility in motivating preventive behavior. Where these perceptions were weak or uncertain, individuals may be less likely to engage in screening and preventive practices. Policy implications include the need for more detailed and targeted health education that emphasizes the specific risks and consequences of Rh incompatibility, thereby strengthening risk perception and encouraging proactive health-seeking behavior [63–65]. Finally, the analysis of the relationship between socio-demographic characteristics and knowledge, attitude, and perception revealed that knowledge was significantly influenced by factors such as age, marital status, education, occupation, and decision-making authority. In contrast, attitude and perception were less strongly associated with these variables, although some significant relationships were observed with occupation and income. These findings suggested that socio-demographic factors played a more critical role in shaping knowledge than in influencing attitudes or perceptions [35, 66, 67]. The higher levels of knowledge observed among older, married, and more educated women may be attributed to increased exposure to antenatal care services and greater access to health information. Similarly, decision-making dynamics within households may affect women's ability to seek and retain health knowledge. These findings are consistent with existing literature, which identifies education and marital status as key determinants of maternal health knowledge [35, 37]. However, the lack of strong associations between socio-demographic factors and perception contrasted with some studies that reported significant influences of these variables on risk perception [43]. The Social Determinants of Health framework provides an appropriate theoretical explanation, highlighting how social and economic conditions shape access to health information and services. From a policy perspective, these findings underscore the need for targeted interventions aimed at vulnerable groups, including younger, less educated, and unmarried women. Efforts should also be made to empower women in health decision-making and to promote equitable access to reproductive health information and services. Strengthening community-based education, improving antenatal counselling, and addressing socio-economic barriers remain key strategies to enhance knowledge, attitudes, and perceptions regarding Rh incompatibility [35–51, 55–67].

5. Conclusion

The study found that although women of reproductive age in PHALGA demonstrated positive attitudes and generally good perception toward Rhesus incompatibility screening, their knowledge especially on causes, risks, and prevention was inadequate. While awareness of general blood grouping was high, understanding of Rh-specific issues such as maternal–foetal incompatibility and Anti-D prophylaxis was limited, indicating a gap between awareness and comprehensive knowledge. .Health workers and antenatal clinics were the main sources of information, highlighting the role of formal healthcare systems. However, persistent uncertainty in perceptions and limited partner communication suggest gaps in the effectiveness of health education. Knowledge was also significantly influenced by socio-demographic factors such as age, education, marital status, occupation, and decision-making authority. Overall, despite a strong foundation of positive attitudes, inadequate knowledge remains a key barrier to effective use of screening and preventive services. The findings emphasize the need for targeted health education, improved awareness of Rh incompatibility, greater male involvement, and equitable access to reproductive health information to enhance prevention and reduce maternal and neonatal risks.

Abbreviations

ANC – Antenatal Care
Anti-D - Anti-D Immunoglobulin
HBM - Health Belief Model
LMICs – Low- and Middle-Income Countries
PHALGA – Port Harcourt Local Government Area
Rh – Rhesus Factor
SPSS – Statistical Package for the Social Sciences
TPB – Theory of Planned Behavior
WHO – World Health Organization

Article Information

Acknowledgments: We want to thank the participating women and research assistants for their cooperation and support throughout the research period. We are also extending our appreciation to the Community entry contacts; Faculty of Basic Medical Sciences, and Rivers State University for granting approval for us to access these individuals.

Author Contributions: B.A.I. - Conceptualization, Methodology, Data curation, Formal analysis, Writing – original draft, Writing – review & editing; K.G.M. - Methodology, Writing – review & editing, Supervision; A.I.W. - Conceptualization, Methodology, Formal analysis, Writing – review & editing, Supervision.

Funding / Financial Support: The authors received no external funding.

Conflict of Interest (Competing Interests): Authors have declared that no competing interests exist.

Ethical Approval:
Permission and Ethical approval for this study was granted by the Ethical Review Committee, Faculty of Basic Medical Sciences, and Rivers State University (Approval No: Number: RSU/FBMS/REC/25/406).

Approval Date: 4th June 2025

Informed Consent: Written informed consent was obtained from all participants.

Data Availability Statement: Data available on reasonable request.

Clinical Trial Registration: Not applicable.

Disclaimer (Artificial Intelligence): The author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.), and text-to-image generators have been used during writing or editing of manuscripts.

References

[1] L. Dean. Blood groups and red cell antigens. National Center for Biotechnology Information (NCBI). 2020.

[2] N. D. Avent and M. E. Reid. The Rh blood group system: A review. *Blood*, 134(24):2106–2113, 2019. URL https://doi.org/10.1182/blood.2019000945.

[3] W. A. Flegel. Molecular genetics of RH and its clinical application. *Transfusion Medicine and Hemotherapy*, 48(2):84–91, 2021. URL https://doi.org/10.1159/000512345.

[4] S. Fanello. Prevention of Rh alloimmunization and management strategies in pregnancy. *Journal of Maternal-Fetal & Neonatal Medicine*, 36(5):1123–1130, 2023.

[5] World Health Organization. *Managing complications in pregnancy and childbirth: A guide for midwives and doctors*. WHO, 2023.

[6] World Health Organization. *Trends in maternal mortality 2000–2023*. WHO, 2023.

[7] National Institute for Health and Care Excellence (NICE). *Routine antenatal anti-D prophylaxis for RhD-negative women*. NICE Guideline, 2021.

[8] Federal Ministry of Health Nigeria. *National guidelines for maternal and newborn health care*. FMOH, Abuja, 2022.

[9] O. T. Ojo and O. I. Akinola. Awareness and utilization of anti-D immunoglobulin among pregnant women in Irrua, Nigeria. *African Journal of Reproductive Health*, 26(4):45–53, 2022.

[10] F. Okonofua. Maternal health service utilization in Nigeria: A review. *African Journal of Reproductive Health*, 24(2):89–101, 2020.

[11] M. Ezeanochie and B. Olagbuji. Cultural determinants of maternal healthcare utilization in Nigeria. *BMC Pregnancy and Childbirth*, 21:123, 2021. URL https://doi.org/10.1186/s12884-021-03567-8.

[12] National Population Commission (NPC. [Nigeria] & ICF. *Nigeria Demographic and Health Survey*, 2024. Abuja, Nigeria, and Rockville, MD, USA, 2024.

[13] O. A. Bolarinwa et al. Fertility patterns and reproductive health outcomes in Nigeria. *PLOS ONE*, 17(6):e0269486, 2022. URL https://doi.org/10.1371/journal.pone.0269486.

[14] A. A. Adebayo et al. Rhesus negative pregnancies and anti-D prophylaxis practices in Nigerian tertiary hospitals. *Nigerian Journal of Clinical Practice*, 24(8):1102–1108, 2021.

[15] A. M. Mukendi et al. Prevalence and determinants of Rhesus incompatibility among pregnant women in Eastern Democratic Republic of Congo. *International Journal of Gynecology & Obstetrics*, 149(2):231–236, 2020.

[16] World Population Review. Port Harcourt population 2023. 2023. URL https://worldpopulationreview.com.

[17] R. S. Iwo-Amah et al. Socio-cultural determinants of maternal healthcare utilization in Southern Nigeria. *African Journal of Reproductive Health*, 26(2):112–120, 2022.

[18] D. C. Ogbuabor and C. Nwankwor. Cultural beliefs and maternal health service utilization in Nigeria. *BMC Pregnancy and Childbirth*, 21:456, 2021. URL https://doi.org/10.1186/s12884-021-03987-6.

[19] Mapcarta. Port Harcourt map and geographical profile. 2024. URL https://mapcarta.com.

[20] Nigeria Property Centre. Port Harcourt area guide. 2024. URL https://nigeriapropertycentre.com.

[21] Rivers State Ministry of Health. *Annual health sector performance report*. RSMOH, Port Harcourt, 2023.

[22] I. P. Okafor and P. N. Eze. Urbanization and health-seeking behavior in Nigeria. *International Journal of Health Planning and Management*, 37(3):1452–1464, 2022.

[23] A. M. Adebayo et al. Socioeconomic factors influencing healthcare utilization in urban Nigeria. *BMC Health Services Research*, 23:214, 2023. URL https://doi.org/10.1186/s12913-023-09123-4.

[24] World Bank. *Nigeria economic update: Urbanization and growth*. World Bank, Washington, DC, 2024.

[25] C. O. Nwosu and P. E. Agwu. Middle-class expansion and healthcare access in Nigeria. *Health Economics Review*, 11:35, 2021. URL https://doi.org/10.1186/s13561-021-00328-7.

[26] S. C. Amadi and E. Wali. Community health campaigns and maternal health awareness in Rivers State. *Nigerian Journal of Public Health*, 35(2):78–86, 2021.

[27] C. F. Anagbogu et al. Knowledge of Rhesus incompatibility among women attending antenatal clinics in Southeast Nigeria. *African Journal of Reproductive Health*, 28(1):65–74, 2024.

[28] S. Azeez Hasan et al. Assessment of knowledge and awareness of Rh incompatibility among reproductive-age women. *BMC Pregnancy and Childbirth*, 25:112, 2025.

[29] E. A. Hawary et al. Attitude and perception towards antenatal screening practices among pregnant women. *Journal of Maternal-Fetal & Neonatal Medicine*, 38(2):245–252, 2025.

[30] Y. Lu et al. Measuring perception and health behavior in maternal health studies. *BMC Public Health*, 24:198, 2024.

[31] R. Mutah and A. Malgwi Nuhu. Perception and utilization of maternal health services among women in sub-Saharan Africa. *International Journal of Gynecology & Obstetrics*, 166(1):89–97, 2024.

[32] A. Agresti. *Statistical methods for the social sciences*. Pearson, 5th edition, 2018.

[33] A. Field. *Discovering statistics using IBM SPSS statistics*. Sage Publications, 5th edition, 2018.

[34] J. Pallant. *SPSS survival manual*. McGraw-Hill, Education, 7th edition, 2020.

[35] C. C. Chukwu and C. Onwuanaku. Maternal knowledge and prenatal practices in South-South Nigeria. *Health Education Research*, 38 (4):245–258, 2023.

[36] E. Umeh and B. Eze. Gaps in reproductive health education among antenatal clients in Nigeria. *International Journal of Women's Health*, 14:533–543, 2022.

[37] O. Adejumo and O. Afolabi. Antenatal care quality and maternal health outcomes. *African Journal of Health Sciences*, 36(2):123–131, 2023.

[38] M. Sambo and M. Ibrahim. Content analysis of antenatal counselling in rural Nigeria. *Journal of Public Health in Africa*, 12(3):1042, 2021.

[39] E. C. Okeke and S. Obi. Male partner involvement and maternal health outcomes in Nigeria. *Global Health Action*, 17(1):2010284, 2024.

[40] G. Bassey et al. Barriers to effective antenatal counselling: A case study from Rivers State. *BMC Pregnancy and Childbirth*, 23(1):415, 2023.

[41] P. U. Kalu. Educational attainment and maternal health knowledge in sub-Saharan Africa. *Social Science Medicine*, 295:114746, 2022.

[42] E. Mensah et al. Maternal health knowledge in West Africa. *Journal of Community Health*, 46(5):843–852, 2021.

[43] L. J. Roberts and M. A. Green. Antenatal education programmes and outcomes in high-income countries. *Maternal and Child Health Journal*, 27(7):1031–1042, 2023.

[44] N. K. Janz and M. H. Becker. The Health Belief Model: A decade later. *Health Education Quarterly*, 11(1):1–47, 1984.

[45] M. D. Dairo et al. Sources of health information and maternal behaviour in Nigeria. *African Journal of Primary Health Care & Family Medicine*, 14:e1–e10, 2022.

[46] F. Okonofua et al. Media engagement strategies in maternal health promotion. *Health Communication*, 36(4):450–459, 2021.

[47] A. O. Adepoju et al. Community-based health promotion and pregnancy outcomes. *Journal of Community Medicine*, 49(1):15–24, 2024.

[48] J. Nwosu and J. Chukwuma. Nurse workload and quality of antenatal counselling. *International Nursing Review*, 68(3):277–286, 2021.

[49] E. M. Rogers. *Diffusion of innovations*. Free Press, 5th edition, 2003.

[50] O. Olatunde et al. Evaluating community outreach campaigns for maternal health. *Public Health Reviews*, 44(1):10, 2023.

[51] J. Brown and L. Wilson. School-based maternal health education: A systematic review. *Health Education Journal*, 81(4):387–404, 2022.

[52] O. Akintola et al. Barriers to partner communication in reproductive health decisions. *BMC Public Health*, 21:567, 2021.

[53] M. U. Chibuzor et al. Socio-cultural influences on antenatal service uptake in Nigeria. *Journal of Health Research*, 36(5):523–532, 2022.

[54] A. J. Afolayan and O. Adeoye. Maternal health attitudes and practices in urban Nigeria. *African Journal of Social Sciences*, 9(1): 76–88, 2024.

[55] M. Fishbein and I. Ajzen. *Predicting and changing behavior: The reasoned action approach*. Psychology Press, 2011.

[56] A. Oladipo et al. Engaging male partners in maternal health: Lessons from Nigeria. *Global Public Health*, 18(7):1150–1163, 2023.

[57] U. Akpan et al. Community interventions and antenatal care service uptake. *Health Promotion International*, 40(1), 2025. daab109.

[58] N. A. Onwuzoo. Perceptions of maternal risk factors in rural Nigeria. *Nigerian Journal of Health Psychology*, 3(1):24–35, 2022.

[59] S. O. Ekpenyong et al. Awareness and perception of maternal health risks in Africa. *SAHARA-J: Journal of Social Aspects of HIV/AIDS*, 20(1):65–78, 2023.

[60] P. Gallagher et al. Perceived risk and maternal behaviours: Comparative study. *Journal of Midwifery Women's Health*, 66(5):612–621, 2021.

[61] N. C. Mbonu et al. Targeted health education and maternal outcomes. *Health Education Behavior*, 50(2):213–222, 2023.

[62] P. Kawungezi et al. Importance of contextualised maternal health promotion. *International Journal of Environmental Research and Public Health*, 19(11):6874, 2022.

[63] B. A. Aina. Education and maternal health literacy in Nigeria. *BMC Education*, 23:102, 2023.

[64] P. Singh and A. Jain. Determinants of maternal health knowledge in South Asia and Africa. *Journal of Global Health Reports*, 6, 2022. Article e2022012.

[65] A. Gebremedhin et al. Socio-demographic influences on health perception: Evidence from Africa. *BMC Public Health*, 21:786, 2021.

[66] United Nations Population Fund (UNFPA). *State of the World's Population 2023: Data for Gender Equality*. UNFPA, 2023.

[67] V. L. Champion and C. S. Skinner. The Health Belief Model. In K. Glanz, B. K. Rimer, and K. Viswanath, editors, *Health behavior*, pages 75–94. Jossey-Bass, 6th edition, 2020.