

Knowledge and Utilization of Malaria Vaccines among Nursing Mothers of Children Aged 5-15Months in Twon-Brass Bayelsa State, Nigeria

Odikeme D. EYIDENGHABOFA¹, Emily Kiridi E. GABRIEL², Solomon M. UVOH^{3*}, and Emmanuel ONOKPITE⁴ <https://orcid.org/0000-0002-3499-3528>

¹Department of health kinetic and health safety studies faculty of natural and applied Sciences, Ignatus Ajuru University of Education Port Harcourt River state, Nigeria.

²Department of Human Physiology, Faculty of Basic Medical Science, College of Health Sciences Niger Delta University, Wilberforce Island Amossoma Bayelsa state, Nigeria.

³Department of Human Physiology, Faculty of Basic Medical Science, College of Health Sciences University of port Harcourt, River State Nigeria.

⁴Department of Anaesthesia and Intensive Care, Faculty of Clinical Medicine, College of Health Sciences, Delta State University Abraka Delta State, Nigeria.

Corresponding Authors Email: solomonu31@gmail.com. <https://orcid.org/0000-0002-1580-9916>

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ABSTRACT

Aim/Objective: Malaria vaccination among ≤5yrs children is an additional tool for preventing plasmodium falciparum in Bayelsa state prompting. Bayelsa was among the Nigerian states to introduce the R21 malaria vaccine through a phase Programme in December 2024. This research assessed nursing mothers' knowledge, utilization of malaria vaccines, and perceived factors affecting access in Twon-Brass, Bayelsa State. **Methods:** Descriptive cross-sectional survey design was reported among 367 nursing mothers of children within 5–15 months randomly using an interviewer structured questionnaire while analysis was done using spss version 26. **Results:** Outcome shows that 76.6% of respondents knew malaria was a serious childhood disease, 67.6% knew that vaccines can protect children against malaria, 60.8% knew that malaria vaccine was provided through routine immunization and 57.8% consider the vaccine safe for children. Regarding utilization, 61.6% reported that their children had received malaria vaccines, 67.3% adhered to immunization schedules, and 56.7% completed required vaccine doses compared to 43.3% children who do not complete the utilization of the malaria vaccines. Major influencing factors included health education (78.7%), family support (75.2%), transportation difficulties (64.3%), and distance to health facilities (59.7%) were commonly reported barriers. 78.7% stated that health education increased their confidence in childhood vaccines. **Conclusion:** Interpretation of receipt and completion requires confirmation of local eligibility, vaccine availability and immunization records. Clear care giver education and accessible, reliable immunization services may support uptake.

Keywords: Children; Malaria vaccine, maternal knowledge, nursing mothers; Vaccine utilization



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INTRODUCTION

Malaria vaccine is a biological preparation with an effect that stimulate the immune system ability to develop protection against infection caused by *Plasmodium* parasites transmitted by mosquitoes (genus of unicellular eukaryotes that are obligate parasite of vertebrates and insect), particularly *Plasmodium falciparum* responsible for malaria-related deaths in Africa. The vaccine induced immune responses to prevent the parasite from infecting hepatocellular cells and decrease its severity after infection. The malaria vaccines are one of the most important achievements in global health due to the parasite complexity and its life cycle (WHO, 2026; Doolan *et al.*, 2023). Malaria is responsible for about 2-3 million deaths yearly and it is also responsible for unexpected morbidity in about 300-500 million people yearly, with sub-Saharan Africa making over 90% of malaria-related deaths. Vaccination is widely recognized as one of the most effective and cost-efficient public health interventions for preventing infectious diseases and reducing childhood death (WHO, 2023). Five species of plasmodium cause malaria in humans include: *plasmodium falciparum*, *plasmodium vivax*, *plasmodium malariae* and *plasmodium ovale*. *P. falciparum* is responsible for most deaths with severe complications, including cerebral malaria, anemia and renal failure (Digban *et al.*, 2017; Chukwuocha & Okorie, 2018; Baiden *et al.*, 2021).

Vaccines are broadly classified into different types based on their composition and mechanism of action, including live attenuated vaccines (e.g., measles, mumps, rubella, and rotavirus vaccines), inactivated vaccines (e.g., inactivated polio vaccine), subunit or conjugate vaccines (e.g., Haemophilus influenzae type b, pneumococcal vaccines), and recombinant vaccines (e.g., RTS,S/AS01 malaria vaccine). Each type activates the immune system differently to provide protective immunity to reduce adverse effects (Musa-Booth *et al.*, 2023). Smith and Attwell (2022) observed that inadequate caregiver knowledge reduced malaria vaccine uptake by 30% across sub-Saharan Africa. Adejumo and Olorukooba (2020) reported that only 49.2% of mothers in Oyo State utilized non-routine childhood vaccines.

The malaria vaccine (RTS, S/AS01 and R21/Matrix-M) is a recombinant protein-based vaccine designed to trigger immunity against the *Plasmodium falciparum* parasite, the most deadly species of malaria. It is administered to infants and young children to reduce severe malaria episodes, hospitalizations, and malaria-related deaths, particularly in high-burden regions like sub-Saharan Africa. In response, the introduction of malaria vaccines such as RTS,S/AS01 and R21/Matrix-M represents a major milestone in malaria control efforts (Musa-Booth *et al.*, 2023; Nguyen *et al.*, 2025; Adeleke *et al.*, 2025). Nursing mothers of children aged 6–12 months represent a key population, as this age range corresponds with completion of rotavirus vaccination schedules and early exposure to malaria prevention interventions (Ariyibi & Ojuawo, 2020). Nursing

mothers with infants 6–12 months make up important group because this period corresponds with critical immunization milestones, including rotavirus vaccine completion and potential malaria vaccine administration (Smith & Attwell, 2022; Odikeme *et al.*, 2022; Nakibuuka *et al.*, 2024). Rotavirus infection is cause severe diarrhoea among infants and young children worldwide. Before vaccine introduction, rotavirus was responsible for approximately 200,000 deaths annually, mostly in developing countries. The rotavirus vaccine has been shown to significantly reduce hospitalizations and mortality related to diarrhoeal diseases (Seale & Leask, 2019; Obianjunwa *et al.*, 2020).

Evidence from Nigeria suggest that knowledge and acceptance should be distinguished from actual vaccine uptake. A physician survey in 2025 reported 68.9% of respondent awareness regarding malaria vaccines uptake compare to substantial minority reporting limited awareness (Seale & Leask, 2019; Dicko *et al.*, 2024; Olumide *et al.*, 2025; Hassan *et al.*, 2025). Rotavirus vaccines are included in the routine immunization schedule for infants, typically administered in two or three doses depending on the formulation (e.g., Rotarix®, Rotavac®, or RotaTeq®) (Obianjunwa *et al.*, 2020; Afolabi *et al.*, 2021). Nonetheless, Obianjunwa *et al.* (2020) reports that, utilization rotavirus vaccine remains suboptimal in many African countries due to limited awareness, misconceptions, and poor access to immunization services. Empirical studies have consistently demonstrated variations in maternal knowledge and utilization of malaria and rotavirus vaccines. Musa-Booth *et al.* (2023) reported that only 41.8% of caregivers in Northern Nigeria were aware of malaria vaccines, while just 28.6% expressed willingness to vaccinate their children. Adeleke *et al.* (2025) reported 52.4% of caregivers' demonstrated poor knowledge of malaria vaccination schedules, and only 46.1% reported utilization among eligible children. Dim *et al.* (2025) reported that willingness to accept malaria vaccines increased to 72.5% among mothers who had received adequate health education. Ibrahim and Adamu (2025) found that only 44.7% of caregivers in Gombe State were willing to accept malaria vaccines, with accessibility and misinformation being major predictors.

Twon-Brass, a coastal community in Brass Local Government Area, is characterized by geographical isolation, dependence on water transportation, and limited access to health information and services. These factors may significantly influence nursing mothers' knowledge and utilization of malaria and rotavirus vaccines. Therefore, understanding maternal knowledge and utilization patterns among nursing mothers of children aged 5–15 months in Twon-Brass is critical, as this is a key period for completing essential vaccination schedules, including rotavirus immunization and, where available, malaria vaccines.

MATERIALS AND METHODS

Study Design

We adopted quantitative descriptive cross-sectional approach to describe reported knowledge utilization of malaria vaccines used practices among nursing mothers. This design is suitable for estimating the distribution of self-reported responses but cannot establish temporal sequence or causation.

Study Area

Twon-Brass, a riverine community located in Brass Local Government Area of Bayelsa State, Nigeria. Twon-Brass is situated along the Atlantic coastline and is predominantly accessible by water transportation, reflecting the riverine nature of the area. The major occupations of residents include fishing, trading, farming, and artisanal activities, with fishing being the dominant livelihood due to proximity to water bodies. The community has limited healthcare facilities, with immunization services largely provided through primary health centres and periodic outreach programs, which may influence vaccine utilization patterns (NBS, 2022).

Study Population

The study population comprised of all nursing mothers children aged 5–15 months residing in Twon-Brass, Brass Local Government Area of Bayelsa State. This population group is considered appropriate because children within this age range are eligible for key immunization services.

Sample Size

This was determined using the Cochran formula.

$$n = \frac{Z^2 p(1-p)}{d^2}$$

n = Sample Size (?)

Z^2 = Z-score value (1.96)

p = Utilization of malaria vaccine reported among mothers in Nigeria 35% (WHO, 2024).

d^2 = (0.05)

$$n = \frac{1.96^2 \times 0.35 \times (1-0.35)}{0.05^2}$$

$$n = \frac{1.96^2 \times 0.35 \times 0.65}{0.05^2}$$

$$n = \frac{0.909594844}{0.0025}$$

n = 349.59 ≈ 350 + 5% non-response rate

n = 350 + 17 = 367 respondents were selected

Technique

Simple random sampling was adopted.

Instrument used

Self-structured interviewer-administered questionnaire developed by the researchers divided into four sections:

A: Socio-demographic characteristics of respondents

B: Knowledge of malaria and rotavirus vaccines

C: Utilization of malaria and rotavirus vaccines

D: Factors influencing utilization of malaria and rotavirus vaccines

The instrument was designed in simple English language to ensure clarity and ease of understanding.

Data Collection Method

This was done through face-to-face administration of the questionnaire to eligible respondents during clinic break periods. This approach helped improve response rate, allow clarification of questions, and ensure completeness of responses.

Data Analysis

Data collected were analyzed using IBM SPSS statistics version 26 while the variables and the study objectives are presented in frequencies and percentages.

Ethical Approval

An ethical approval was obtained from director of health care services in Brass Local Government Area and the chairman, community development committee Twon-Brass before commencement. Participants consent was sorted prior to data collection.

RESULTS

Presentation of Demographic Data

Results on age distribution indicate that most respondents, 146(39.8%), were within the age range of 20–29 years, followed by 121(33.0%) respondents aged 30–39 years. Respondents aged 40 years and above accounted for 52(14.2%), while those below 20 years constituted 48(13.1%). Majority of respondents, 256(69.8%), were married, while 59(16.1%) were single. Divorced respondents accounted for 24 (6.5%), and widowed respondents constituted 28(7.6%). The respondents education showed that 149(40.6%) had secondary education, 90(24.5%) had tertiary education, 87(23.7%) had primary education, while 41(11.2%) had no formal education. 128(34.9%) were traders, 72(19.6%) were involved in fishing, 61(16.6%) were civil servants,

Table 1: Characteristics of the Respondents.

CHARACTERISTICS	RESPONSE	FREQUENCY n=(367)	PERCENTAGE (%)
Age (years)	Below 20	48	13.1
	20-29	146	39.8
	30-39	121	33.0
	40 years and above	52	14.2
Marital status	Single	59	16.1
	Married	256	69.8
	Divorced	24	6.5
	Widowed	28	7.6
Education	Nil	41	11.2
	Primary	87	23.7
	Secondary	149	40.6
	Tertiary	90	24.5
Occupation	Trading	128	34.9
	Fishing	72	19.6
	Farming	54	14.7
	Civil servant	61	16.6
	Others	52	14.2
Religion	Christianity	312	85.0
	Islam	27	7.4
	Traditional	18	4.9
	Others	10	2.7
Number of Children	1	94	25.6
	2-3	182	49.6
	4 and above	91	24.8

Source: Field work (2026)

Table 2: Distribution of Responses on Knowledge of Malaria Vaccines (n=367).

Knowledge Variables	Yes (%)	No (%)	Total %
Do you know that malaria is a serious disease that affects young children?	281(76.6)	86(23.4)	100
Do you know that vaccines can protect children against malaria?	248(67.6)	119(32.4)	100
Are you aware that malaria vaccine is given through routine immunization service?	223(60.8)	144(39.2)	100
Do you know that completing all vaccine dose is important for child protection?	254(69.2)	113(30.8)	100
Do you believe that malaria vaccine are safe for your children?	212(57.8)	155(42.2)	100
Are you aware that missing vaccination appointments can expose children to diseases?	239(65.1)	128(34.9)	100
Do you receive adequate information about vaccines from health workers	201(54.8)	166(45.2)	100

SOURCE: Field work (2026)

54(14.7%) were farmers, while 52(14.2%) engaged in other occupations. 312(85.0%) of respondents were Christians, 27(7.4%) were Muslims, 18(4.9%) practiced traditional religion, while 10(2.7%) belonged to other religious groups. With respect to the number of children, 182(49.6%) respondents had 2–3 children, 94(25.6%) had one child, while 91(24.8%) had four or more children (Table 1).

Level of Knowledge of Nursing Mothers Regarding Malaria Vaccines

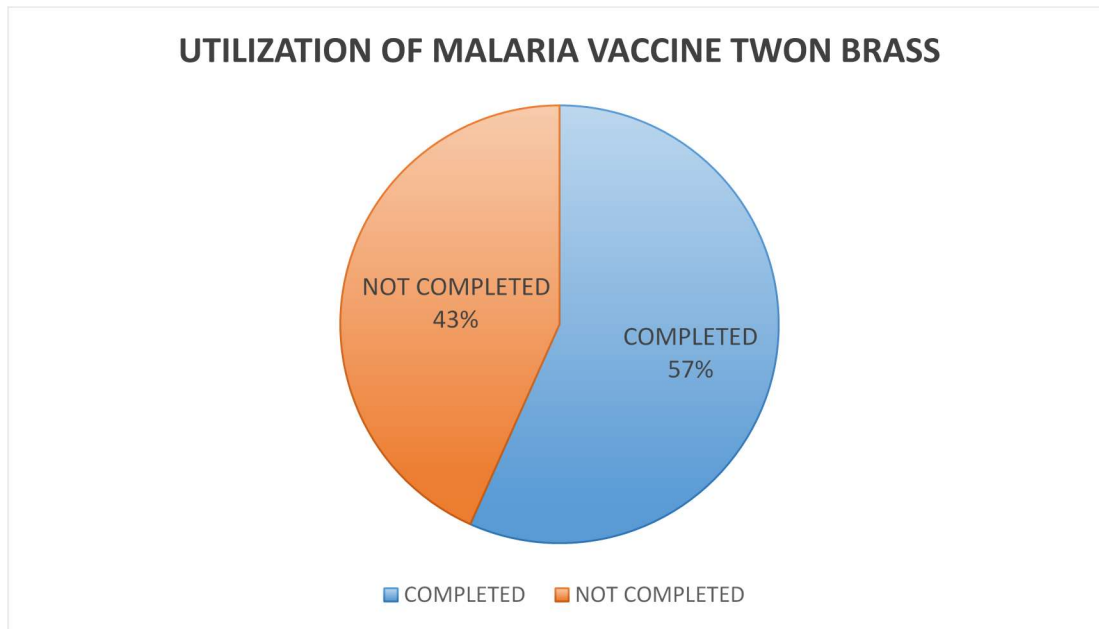
Among the 367 respondents, 281(76.6%) knew that malaria is a serious disease affecting young children, while 86(23.4%) did not. 248(67.6%) of respondents knew that

vaccines can protect children against malaria, whereas 119(32.4%) lacked such knowledge. 223(60.8%) of respondents were aware that malaria vaccines are provided through routine immunization services, while 144(39.2%) were unaware. 254 (69.2%) of respondents knew that completing all vaccine doses is important for child protection, while 113 (30.8%) did not. 212(57.8%) of respondents believed malaria vaccines are safe for children, whereas 155(42.2%) expressed doubts. 239(65.1%) of respondents were aware that missing vaccination appointments could expose children to diseases, while 128 (34.9%) were unaware. 201(54.8%) respondents reported receiving adequate vaccine information from health workers, while 166(45.2%) indicated otherwise (Table 2).

Table 3: Distribution of responses on utilization of malaria vaccines.

Utilization Variables	Yes n (%)	No n (%)	Total %
Has your child received the malaria vaccine?	226(61.6)	141(38.4)	100
Do you take your child for immunization according to schedule?	247(67.3)	120(32.7)	100
Do you keep your child's immunization card properly?	263(71.7)	104(28.3)	100
Do you attend immunization clinics regularly?	218(59.4)	149(40.6)	100
Has your child completed all required vaccine doses for age?	208(56.7)	159(43.3)	100
Do you return to health facilities for follow-up doses?	214(58.3)	153(41.7)	100
Do you encourage other nursing mothers to immunize their children?	242(65.9)	125(34.1)	100

Source: Field work (2026)

**Figure 1:** Utilization of Malaria Vaccine in Twon-Brass

Level of Utilization of Malaria Vaccines among Children

The observation showed that 226(61.6%) respondents reported that their children had received malaria vaccines, while 141(38.4%) had not. 247(67.3%) respondents stated that they took their children for immunization according to schedule, while 120(32.7%) did not. Majority 263(71.7%), reported keeping immunization cards properly, whereas 104 (28.3%) did not. 218(59.4%) respondents attended immunization clinics regularly, while 149 (40.6%) did not. 208(56.7%) respondents reported that their children had completed all vaccine doses appropriate for age, while 159(43.3%) had not. 214(58.3%) returned for follow-up doses, while 153 (41.7%) failed to do so. 242(65.9%) encouraged other mothers to immunize their children, while 125(34.1%) did not (Table 3 and Figure 1).

Factors Influencing the Utilization of Malaria Vaccines among Nursing Mothers

The findings showed that 219(59.7%) respondents

indicated that long distance to health facilities affects their clinic attendance, whereas 148(40.3%) reported that distance does not affect their attendance. 236(64.3%) respondents stated that lack of transportation makes it difficult to access immunization services, while 131(35.7%) indicated that transportation does not pose any challenge. 202(55.0%) respondents reported that unavailability of vaccines affects their child's immunization, whereas 165(45.0%) stated that vaccine availability does not affect their child's immunization. 223(60.8%) respondents indicated that the attitude of health workers influences their use of immunization services, while 144(39.2%) reported that healthcare workers' attitudes do not affect their utilization of such services. 181(49.3%) respondents reported that fear of vaccine side effects discourages them from vaccinating their children, whereas 186(50.7%) indicated side effects does not discourage them. 159(43.3%) respondents indicated that their beliefs affect their decision to vaccinate their children, while 208(56.7%) reported that their beliefs do not influence their vaccination decisions. 276(75.2%) respondents reported that their spouses or family members support the

Table 4: Distribution of responses on factors influencing utilization of malaria vaccines.

Factors influencing Utilization	Yes n (%)	No n (%)
Does long distance to health facilities affect your clinic attendance?	219(59.7)	148(40.3)
Does lack of transportation make it difficult to access immunization services?	236(64.3)	131(35.7)
Does unavailability of vaccines affects your child's immunization?	202(55.0)	165(45.0)
Does the attitude of health workers influence your use of immunization service?	223(60.8)	144(39.2)
Does fear of vaccine side effects discourage you from vaccinating your child?	181(49.3)	186(50.7)
Does your beliefs affect your decision to vaccinate your child?	159(43.3)	208(56.7)
Does your spouse or family support immunization of your child?	276(75.2)	91(24.8)
Does health education increase your confidence in childhood vaccines?	289(78.7)	78(21.3)

Source: Field work (2026)

immunization of their children, while 91(24.8%) indicated that they do not receive such support. 289(78.7%) respondents stated that health education increases their confidence in childhood vaccines, whereas 78(21.3%) reported that health education does not influence their confidence (Table 4).

DISCUSSION

Findings from this study indicate that 61.6% nursing mothers presented their children for immunization. This observation is not congruent with Adejumo & Olorukooba (2020) who reported 49.2% mothers in Oyo State that utilized non-routine childhood vaccines. Recent study conducted by Dim *et al.* (2025) noted an increased (72.5%) willingness to accept malaria vaccines among mothers who had received adequate health education; however our findings indicate 67.6% of mother's willingness that accepted the vaccine. This observation is also contrary to Ibrahim & Adamu (2025) that noted only 44.7% of caregivers in Gombe State that were willing to accept malaria vaccines, though accessibility and misinformation was a major predictors.

The study also observed that 76.6% nursing mothers were of malaria being a disease affecting children that requires urgent attention whereas 23.4% was not aware. Previous studies have shown that mothers with adequate knowledge of the vaccine are about three times ready to have their children immunized compare to those with lesser knowledge (Ariyibi & Ojuawo, 2020). Furthermore, 67.6% mothers understand the protective effect of the malaria vaccine to their children. This finding is not in congruent with that of Musa-Booth *et al.*, 2023 that reported 41.8% among care givers in northern Nigeria compare to only 28.6% that expresses willingness in that region of the country. Caregivers that understand malaria as a threat to children show higher acceptance rate to the vaccine (Babalola *et al.*, 2020; Oladimeji *et al.*, 2022). Regarding routine aspect of the malaria vaccine, 60.8% were duly aware while 57.8% believe it is safe for children while 54.8% mothers received adequate information from health workers regarding the importance of the vaccine to children. Awareness and trust provided by health care

agents has significant influence on mother's perception to accept the vaccine (Diawara *et al.*, 2021). It has been reported from previous studies that children from stable higher income family's complete vaccination at a rate of 74.8% and 79.6% compare to lower income households of 48.5% and 56.3% respectively. The above finding is similar to our observation in the current study of 57% completion rate compared to 43% non-completed routine vaccine among mothers in Twon-Brass. Nursing mothers in this current study (65.9%) play important role by encouraging their fellow counterpart (mothers) to immunize their children as against 34.1% who do not. Other past studies concentrated on friends and different sources rather than focusing on fellow mothers noted (39.3%) that is not in agreement with our findings (Joseph *et al.*, 2026). Previous studies by Daniel *et al.* (2020) conducted in Ethiopia observed that mothers with secondary school cert education status possess more adequate knowledge than those without basic education regarding maternal preparedness and its health benefits to children. This observation is consistent with our study of 40.6% secondary school mothers with certificate compare to 11.2% mothers with no education. Odikeme *et al.* (2022) observe that vaccines utilization completeness rate was lower (6%) among urban dwellers compared to rural settlers of 9%. Conversely, our study of 61.6% utilization of malaria vaccine is not in agreement with previous study mentioned above.

CONCLUSION

Nursing mothers in Twon-Brass had moderate knowledge and utilization of malaria vaccines. Though, the awareness and acceptance of malaria vaccination were relatively encouraging, many hindrances limit optimal utilization and completion of schedule vaccines. This findings are local, descriptive and dependent on the accuracy of self - reported completion of age appropriate doses.

Conflict of Interest: None declared.

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