Kanem J Med Sci 2022; 16(1): 32 -38
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ISSN 2006-4772
https://doi.org/10.36020/kjms.2022.1601.004

Original Article

Awareness, Perception and Acceptance of Malaria Vaccine among Women of the Reproductive Age Group in a rural community in Soba, Kaduna State, North-west Nigeria.

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ABSTRACT

Introduction: Malaria vaccine is one of the novel strategies currently being evaluated for use in malaria control in children under five**. Objectives**: The study aimed to determine the awareness, perception and acceptance of malaria vaccine among women of the reproductive age group in a rural community in Soba Local Government Area of Kaduna State, North-West Nigeria. **Methodology:** It was a cross-sectional study and total population sampling was used to recruit 236 women aged between 15-49 years. The data were collected using an open data kit (ODK-1) mounted on android tablets and entered into International Business Machine Statistical Package for Social Sciences (IBM SPSS) version 23 Software. Binary logistic regression was used to examine the relationship between the predictor and the outcome variables. A p-value of less than or equal to 0.05 was considered statistically significant. **Results:** Only 131 (56%) of the subjects ever heard about malaria vaccines. Of these, 95 (72.5%) knew that the vaccine could prevent malaria and 104 (96.8%) believe that the vaccine was necessary for the prevention of malaria. Further, 89 (67.9%) subjects among those aware of the vaccine would voluntarily allow their children to get vaccinated and 93 (71%), would recommend the vaccines for others. Similarly, 98 (74.8%) of those aware of the vaccine would recommend the vaccine for the National Program on Immunisation. **Conclusion:** The awareness of the malaria vaccine in the subjects was low while the perception and acceptability of the vaccine were high. None of the risk factors investigated was independently related to awareness of the vaccine. Public enlightenment and further qualitative studies to explore a context-specific perception of the malaria vaccines are recommended.

Keywords: *Acceptance, Awareness, Malaria Vaccine, Perception, Rural, Nigeria*

Introduction

Malaria is an important life-threatening febrile illness caused by *Plasmodium spp* and although preventable and treatable, it remains the leading killer of children worldwide.[1] In 2020, up to 241 million malaria cases and 627,000 deaths occurred globally.[1] In the same year and in about every minute, a child has died of malaria in sub-Saharan Africa with Nigeria accounting for more than a quarter of cases[1] Similarly, Malaria in pregnancy has led to the delivery of 819,000 children with low birth weight in addition to contributing to

Cite this article as: Sani Musa, Abdulhakeem Abayomi Olorukooba, Nuru Suleiman Muhammad, Bilqis Muhammad, Hauwa Umar Makarfi. Awareness, Perception and Acceptance of Malaria Vaccine among Women of the Reproductive Age Group in a rural community in Soba, Kaduna State, North-west Nigeria.. Kanem J Med Sci 2022; 16(1): 32-38

Submitted: 9th March 2022 **Accepted: 14th June 2022** **Published: 31st August, 2022**

high maternal morbidity and mortality in 2020.[1] Therefore, the persistence of malaria burden particularly in sub-Saharan Africa, calls for intensified control efforts as well as the integration of novel strategies into the existing pool of malaria control measures.

Malaria vaccine such as Mosquirix (RTS, S/AS01 (RTS, S) is being evaluated for use in malaria control in children under five since 2016.[2] As the World Health Organisation (WHO) is set to deploy this vaccine in pilot studies across sub-Saharan Africa in 2019[3], it is important to examine its awareness, perception and acceptability among the communities that are worst hit by this disease.

Women in the reproductive age group are central to the control of malaria because they and their unborn fetuses suffer the consequences of malaria during pregnancy.[4] These include severe malaria and all its complications in pregnant women and prematurity, low birth weight and neonatal sepsis in newborns.[5] They are also the ones that take care of the under-five, which includes taking them for primary health care services such as vaccination. Awareness of malaria vaccine was reported as low in southeast Nigeria[6], where there has been better uptake of previous vaccines compared to the northern part of the country.[7]

The public health implications of poor awareness of the vaccine may include poor uptake of the vaccine and a waste of resources used to produce and distribute the vaccine.[8]

We, therefore, undertook to study the awareness, perception and acceptance of malaria vaccine among women of the reproductive age group in a rural community in Soba, Kaduna State, Nigeria.

Objectives

The study aimed to determine the awareness, perception and acceptance of malaria vaccine among women of the reproductive age group in a rural community in Soba Local Government Area of, Kaduna State, North-West Nigeria. It further sought to determine the relationship, if any, between the awareness of the vaccine and the socio-demographic factors.

Materials and method

This was a cross-sectional descriptive study conducted at Kwasallo village, in Soba Local Government Area of Kaduna State, North-west Nigeria. The area is hyperendemic for malaria with transmission occurring throughout the year with peaks during the rainy season.[9] Vaccination rate is Sub-optimal due to vaccine hesitancy arising from socio-cultural and religious motives.[10] The village had an average population of about 2600 majority of who were children under five.[11]

The minimum sample size was determined by the formula;[12]

$$n_0 = \frac{Z^2pq}{d^2}$$

Where n_0 = desired sample size

z = standard normal deviate corresponding to 95% confidence interval i.e. 1.96
p = Awareness of the fourth-coming malaria vaccine, 11.8 % of participants in mainland Tanzania.
q = 1- p, d = degree of freedom.
p = 11.8% q = 1-0.0118 = 0.09d = 0.05(5% precision)

$$\mathbf{n_0} = \frac{(1.96)^2 \times 0.118 \times 0.882}{(0.05)^2} = 150$$

$\mathbf{n_0}$=150. Allowing for 10% non-response rate;
$\mathbf{n_0}$ =150+15= 165 = 165 (to the nearest whole number).
Therefore; $\mathbf{n_0 = 165.}$

This was the minimum sample size, however, because the data used as part of a larger study and no additional resources were needed to increase the sample size, a total of 236 women already interviewed were used to increase the precision of the study.

Total population sampling was used to select 236 women aged between 15-49 years who reside permanently in the village. The Kaduna State Ministry of Health approved the study. Besides, permission was sought from the Local Government and the village authorities before conducting the survey. The research was performed at no cost to the subjects and in strict compliance with all the provisions of the Helsinki declaration.[13]

The contents of the questionnaires were explained thoroughly to all the respondents. Informed consent was obtained from each subject and the subjects were interviewed using a validated, pre-tested, interviewer-administered questionnaire.

The data were collected using an open data kit (ODK 1) mounted on 7-inch android tablets and entered into the International Business Machines Statistical Package for the Social Sciences (IBM SPSS version 23, 2015) Software. The data were protected on the computer by a password known only to the researchers. Data cleaning was performed and binary logistic regression was used to examine the relationship between the predictor and the outcome variables. The results were presented in prose, tables and figures. A p-value of less than or equal to 0.05 was considered statistically significant.

Results

A higher proportion of the subjects were aged 15-24 years (44%), and the least age category was those belonging to the age group 45-54 (4.3%). The respondents were predominantly married (96.2%), Hausas by tribe (91.5%), and Muslims (98.7%). Slightly over half of the respondents had only Qur'anic education (68.6%) and were not employed (54.2%). Table 1 below shows the sociodemographic characteristics of the respondents.

Table 1: Socio-Demographic Characteristics of Subjects (n = 236)

Socio-Demographic Variable	Categories	Frequency (%)
Age (years)		
	15-24	104 (44.0)
	25-34	88 (37.3)
	35-44	37 (15.6)
	45-49	7 (3.1)
Marital Status	Single	5 (2.1)
	Married	227 (96.2)
	Divorced	3 (1.3)
	Separated	1 (0.4)
Ethnicity	Hausa	216 (91.5)
	Fulani	18 (7.7)
	Igbo	1 (0.4)
	Yoruba	1 (0.4)
Religion	Islam	233 (98.7)
	Christianity	3 (1.3)
Highest level of Education	None	27 (11.8)
	Primary	32 (14.0)
	Qur'anic	161 (68.6)
	Secondary	12 (5.5)
Employment status	None	128 (54.2)
	Farming	12 (5.1)
	Petty Trading	85 (36.0)
	Artisans	6 (2.5)
	Civil servants	2 (0.9)
	Other Occupation	3 (1.3)

Awareness of malaria vaccine

Up to 131 respondents (56%) were aware of the existence of the malaria vaccine. This is shown in fig 1 below;

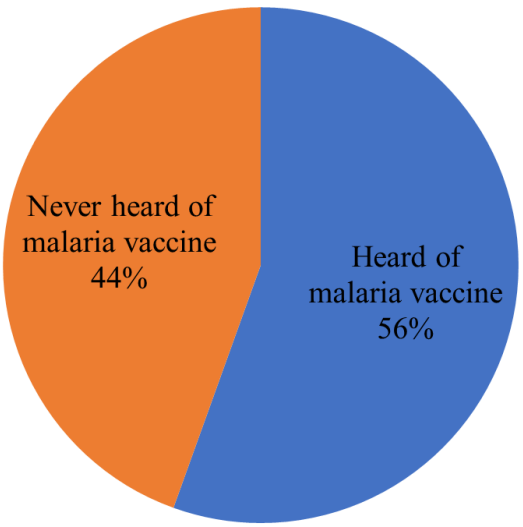

Fig 1: Awareness of Malaria vaccine among the respondents

Of those aware of the malaria vaccine, 95 (72.5%) knew that a malaria vaccine could prevent malaria infection and 104 (79.4%) believed that the vaccine is necessary for the prevention of malaria. Further, 89 (67.9%) of the subjects aware of the vaccine would voluntarily allow their children to get vaccinated and 93 (71%) would recommend the vaccines for others. Similarly, 98 (74.8%) of those aware of the vaccine would recommend the vaccine for the National Program on Immunisation. Table 2 below shows the distribution of subjects aware of the malaria vaccine by their perception and acceptance of the vaccine.

Table 2: Distribution of subjects aware of the malaria vaccine by their perception and acceptance of the vaccine (n = 131)

Question	Response	Frequency (%)
Does malaria vaccine prevent malaria?	Yes	95 (72.5)
	No	15 (11.5)
	Don't know	21 (16.0)
Is malaria vaccine necessary for the prevention of malaria?	Yes	104 (96.8)
	No	14 (2.1)
	Don't know	13 (1.1)
Will you voluntarily allow your child to be vaccinated?	Yes	89 (67.9)
	No	24 (18.4)
	Don't know	18 (13.7)
Will you recommend the vaccine to others?	Yes	93 (71.0)
	No	15 (11.5)
	Don't know	23 (17.5)
Will you recommend a malaria vaccine for NPI?	Yes	98 (74.8)
	No	1 (9.9)
	Don't know	20 (15.3)

NPI = National Programme on Immunisation

There was no statistically significant relationship between the awareness of malaria vaccine and the age categories (p = 0.58), marital status (p = 0.72), tribe (p = 0.502), religion (p = 0.536), level of education (p = 0.324), and occupation (p = 0.151).

There was also no statistically significant relationship between awareness of the malaria vaccine and history of pregnancy (p = 0.58), use of insecticide treated bed net (p = 1.000), antenatal care attendance (p = 0.125), and use of malaria prophylaxis (p = 1.000). Logistic regression analysis of the factors associated with the awareness of the malaria vaccine revealed no independent predictor of the awareness of the malaria vaccine.

Table 3: Factors associated with awareness of the malaria vaccine (n = 131)

Risk factor		Aware of malaria vaccine		Crude OR		
		Yes n (%)	No n (%)	OR	95% CI	P
Age (years)	15-24	18 (38.3)	37 (44.0)	1		
	25-34	15 (31.9)	31 (36.9)	2.056	(0.267-15.797)	0.489
	35-44	12 (25.5)	14 (16.7)	2.067	(0.265-16.128)	0.489
	45-54	2 (4.3)	2 (2.4)	1.167	(0.142-9.586)	0.886
Marital status	Married	47 (100.0)	81 (96.4)	1		
	Divorced	0 (0.0)	2 (2.4)	0.000	(0.00-0.00)	1.000
	Widowed	0 (0.0)	1 (1.2)	1.000	(0.00-0.00)	1.000
Tribe	Hausa	45(95.7)	73 (86.9)	1		
	Fulani	2 (4.3)	9 (10.7)	0.000	(0.00-0.00)	1.000
	Igbo	0 (0.0)	1 (1.2)	0.000	(0.00-0.00)	1.000
	Yoruba	0 (0.0)	1 (1.2)	0.000	(1.00-0.00)	1.000
Religion	Islam	47 (100)	82 (97.6)	1		
	Christianity	0 (0.0)	2 (2.4)	0.00	(0.000-0.000)	0.999
Highest level of Education	None	2 (4.3)	7 (8.3)	1		
	Primary	11 (23.4)	10 (11.9)	2.33	(0.21-25.25)	0.486
	Quranic	32 (68.1)	64 (76.2)	0.606	(0.083-4.405)	0.621
	Secondary	2 (4.3)	3 (3.6)	1.333	(0.212-8.386)	0.759
Occupation	None	22 (46.8)	49 (58.3)	1		
	Farming	0 (0.0)	5 (6.0)	2.056	(0.267-15.797)	0.577
	Trading	23 (48.9)	27 (32.1)	2.067	(0.265-16.128)	0.99
	Artisans	1 (2.1)	2 (2.4)	1.174	(0.069-19.834)	0.911
	Civil servants	1 (2.1)	1 (1.2)	2.000	(0.051-78.250)	0.711

OR = Odds Ratios, CI = Confidence Interval, P = P-value, n = Number of subjects

Table 4: Other factors associated with awareness of the malaria vaccine (n = 131)

Risk factor		Aware of malaria vaccine		Crude OR		
		Yes n (%)	No n (%)	OR	95% CI	P
Ever pregnant	Yes	46 (97.9)	1 (2.1)	1		
	No	74 (88.1)	10 (11.9)	0.161	(0.020-1.298)	0.086
Attended ANC	Yes	36 (94.7)2	54 (83.1)	1		
	No	(5.3)38	11 (16.9)	0.273	(057-1.304)	0.104
Use ITN during ANC period?	Yes	(77.8)18	52 (77.8)	1		
	No	(22.2)45	23 (22.2)	1.000	(0.363-2.758)	1.000
Malaria prophylaxis during ANC	Yes	(83.3)21	60 (83.3)	1		
	No	(16.7)	15 (16.7)	1.000	(0.323-3.101)	1.000

OR = Odds Ratios, CI = Confidence Interval, P = P-value, n = Number of subjects

Discussion

This study to the best of our knowledge, documents for the first time the awareness, perception and acceptance of the malaria vaccine among women of the reproductive age group in north-western Nigeria. It is very important to understand the awareness, perception and acceptance of the malaria vaccine long before it is introduced. The proper understanding of the situation would help in providing stakeholders with information to be used in campaigns to encourage the public to use the vaccine when available. This will likely improve the success of the vaccination campaign and boost public confidence in the prospective vaccine. This is crucial because the cost involved in rolling out the malaria vaccine has been estimated to be very high.[14] Accordingly, good uptake of the vaccine will be very important to avoid waste of resources, particularly in resource-constraint settings.

In the current study, the awareness of the malaria vaccine was low. However, given the low level of education among the participants and the rural nature of the settlement, the level of knowledge of the vaccine was unprecedented. This could be so because 88% of the women interviewed have ever received antenatal care and have probably received health talks which included the topic of the malaria vaccine. Further, over half of the respondents were aged 25 years and above implying that they could have been taking their children for the routine vaccination which is another avenue for health education where the malaria vaccine could have been mentioned.

In contrast, a study in Enugu found a lower rate (48.2%) of awareness of the malaria vaccine.[7] This is, even though, the Enugu study was urban and the subjects were much more educated compared to the present study. Likewise, the awareness of the malaria vaccine recorded in the present study was higher than what was obtained on the mainland Ibadan (20.1%)[15] and Tanzania (11.8 %).[16] The awareness was much higher compared to the previous studies highlighted above probably, because, the present study was conducted when the malaria vaccine pilot studies have begun in Africa.[17] This could translate to more information on the malaria vaccine being circulated compared to earlier times. It is WAS also possible that social desirability bias had affected the responses since they were aware that the interviewers were medical doctors and also aware of the 'favourable response.'

In the present study, awareness of the malaria vaccine was not significantly related to socio-demographic characteristics, history of pregnancy, receipt of malaria prophylaxis, use of insecticide treated bed nets and antenatal care attendance.
In contrast, many other studies have found socio-demographic factors to be associated with awareness of the malaria vaccine.[18,19] Of particular importance was maternal education which has been found to be significantly related to awareness of previous vaccines and their uptake.[20,21] The finding that the sociodemographic factors were not significantly related to the awareness of the malaria vaccine could be explained by the small sample size of this study.

The perception and acceptance of the anticipated

malaria vaccine were excellent in the present study. However, it is left to be seen whether this will translate to good uptake of the vaccine when it is finally available. The favourable disposition of the subjects of this study to the vaccine could be related to the success of the previous vaccines of the National Programme on Immunisation like which was reported from Ghana.[22] *Similar results were reported from Enugu.*[7] This study was limited by a relatively small sample size which made the sample for the subgroup analysis very small and probably explains why none of the factors was significantly related with the awareness of the vaccine.

Conclusion and Recommendation

The awareness of the malaria vaccine among women of the reproductive age group was high. The majority of the respondents had a good perception and acceptability of the vaccine. None of the risk factors investigated was independently related to awareness of the vaccine. Public enlightenment about the existence of the malaria vaccine and its potential to contribute to the control of malaria is recommended. Also, further qualitative studies are recommended to explore a setting and context-specific perceptions about the malaria vaccine.

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