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Sex of household head and women's willingness to accept malaria vaccine for children under five years in Ghana

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Abstract

Background: The malaria vaccine is effective in reducing the burden of malaria among children under five.

Objective: This study examined the influence of the sex of the household head on Ghanaian women of reproductive age's willingness to accept malaria vaccine.

Methods: This study analysed data from the 2019 Ghana Malaria Indicator Survey. It included 730 (weighted) women of reproductive age with no exposure to the GoodLife Campaign. The outcome variable of interest was a willingness to accept the malaria vaccine for children. The data were analysed using descriptive statistics and multivariable logistic regression with the aid of Stata/SE version 17.

Results: The majority (59.8%) of the participants were from male-headed households. The results showed that 36% of women had heard about the malaria vaccine, and 88% were willing to accept it. Women in female-headed households (AOR = 2.01, 95% CI: 1.03 - 3.91), those who professed traditional religion (AOR = 7.52, 95% CI: 1.13 - 49.77), those who knew that malaria is covered by NHIS (AOR = 2.49, 95% CI: 1.44-4.31), and those residing in the Ashanti region (AOR = 9.41, 95% CI: 1.64 - 53.98) were more willing to accept the malaria vaccine.

Conclusion: This study demonstrated that women with female household heads were more willing to accept the malaria vaccine than those with male-headed households. Going forward, interventions geared towards increasing willingness to accept malaria vaccine among women with no exposure to malaria campaigns would have to prioritise women living in male-headed households.

Keywords: Malaria vaccine, acceptance, sex of household head, Ghana

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INTRODUCTION

Malaria remains a serious public health concern in sub-Saharan Africa (SSA). According to the 2024 World Malaria Report, 263 million cases were reported in 2023, higher than the 233 million as reported in 2019. More than nine in ten (94%) of the malaria cases and 95% of the malaria-related deaths in 2023 occurred in SSA [1]. The majority (78%) of the malaria deaths occurred among children under five years. In Ghana, malaria is a public health threat and a major cause of death among children under five years old. In 2022, about 5.2 million Ghanaians were infected with malaria, with a quarter of malaria-related deaths occurring among children under five years [2,3].

Malaria-endemic countries worldwide have adopted several strategies, including distributing insecticide-treated nets (ITNs) and indoor residual spraying, to reduce malaria mortality and morbidity. In Ghana, the National Malaria Elimination Programme (NMEP) was established to reduce the burden of malaria by 75% by 2020. The programme employed several strategies to achieve this target, including distributing long-lasting insecticide-treated nets, indoor

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residual spraying, and antimalarial medications [2]. Additionally, intermittent preventive treatment for malaria has been promoted among pregnant women. Among other interventions, the GoodLife Campaign (GLC) was launched in 2009 to increase uptake of malaria-related services, including sleeping under mosquito nets and testing before treatment [4]. The GoodLife Campaign is a national Behavioural Change Communication (BCC) initiative that employs multimedia, including television shows, game shows, songs, and billboards, to link personal happiness to the practice of healthy behaviour [5]. Available evidence shows that the GLC has wide coverage and has contributed considerably to the adoption of malaria preventive behaviours, including the use of insecticide-treated nets [4].

The discovery of the malaria vaccine for children is another important milestone in the fight against malaria in SSA. A systematic review demonstrated positive acceptance of the malaria vaccine in SSA [6]. Ghana was among the first countries in SSA to adopt the malaria vaccine (RTS, S) for children [2]. Through the Expanded Programme on Immunisation (EPI), children receive four doses of the RTS,S malaria vaccine between 6 months and 2 years of age. The malaria vaccine has been widely accepted by health workers and caregivers in the country, with high uptake [7–9]. Evidence shows that the RTS,S malaria vaccine effectively reduced the burden of uncomplicated malaria among children under five in the Upper East region [10].

Reports indicate that the uptake of the first dose is high, but there has been a decline in the uptake of the second and third doses of the vaccine [8,11]. Additionally, existing studies have reported malaria vaccine hesitancy among parents. For instance, a cross-sectional study in Ghana found that about three in ten parents hesitated to accept the malaria vaccine [12]. Another study found that rumours (i.e., WHO did not approve the vaccine, the vaccine could sterilise or kill children) in the community about the malaria vaccine were a significant barrier to its implementation and contributed to vaccine refusal among caregivers [13]. Vaccine hesitancy and refusal may be common among caregivers with no exposure to malaria-related BCC interventions such as GLC.

Additionally, prior studies among the general population have shown an association between the sex of the household head and uptake of malaria-related interventions, including insecticide-treated net use, intermittent preventive treatment for malaria in pregnancy, and indoor residual spraying [14,15]. Thus household head plays a significant role in health decision-making, including willingness to accept vaccines [16]. The influence of the household head may be strong among women with no exposure to BCC interventions, as they may have limited malaria-related information and autonomy to make informed health decisions. Moreover, women in Africa usually seek their partners'/husbands' approval, who are mostly the household heads, before accessing child health services [17]. For instance, a study in Ethiopia found that women without their partner's approval were hesitant to accept the malaria vaccine [18].

Notwithstanding, there is minimal literature on the intersection of gender dynamics in household leadership and willingness to accept the malaria vaccine in Ghana. Understanding the gender dynamics and drivers of willingness to accept the malaria vaccine among this vulnerable population can guide stakeholders in designing more inclusive, tailored, and gender-sensitive strategies. Addressing this gap will increase willingness to accept and uptake of the malaria vaccine among underserved populations and contribute to the broader discourse on equitable access to public health services. Additionally, this is the maiden study in Ghana to investigate non-exposure to malaria-related BCC initiatives and willingness to accept the malaria vaccine. Therefore, this study sought to examine the level of willingness to accept the malaria vaccine and the influence of the household head's sex on this willingness among women of reproductive age with no exposure to the GoodLife Campaign.

MATERIALS AND METHODS

Data source

The data were from the 2019 Ghana Malaria Indicator Survey (GMIS). The GMIS was conducted by the Ghana Statistical Service (GSS) with technical and financial support from USAID and ICF International. The 2019 GMIS collected information on malaria-related indicators, including exposure to GLC, mosquito net use, awareness of the malaria vaccine, and willingness to accept the malaria vaccine for children under 5 years old. Additionally, the survey collected information on participants' characteristics, including age, educational status, wealth index, religion, and the sex of the household head.

Population and sampling

The target population for GMIS included women of reproductive age (15 - 49 years). The GMIS employed a stratified two-stage cluster sampling procedure. Before sampling the participants, the country's administrative regions were stratified into rural and urban areas. The first stage of the sampling procedure involved selecting 200 enumeration areas or clusters using probability-proportional-to-size sampling. The second stage of the sampling comprised systematically listing and sampling 30 households from each cluster, for a total of 6000 households. Households that declined to participate in the study were not replaced. The eligibility criteria included women aged 15 – 49 years who were either permanent residents of the household or visitors who had spent the night before the survey in the selected household. The data analysed in this study was obtained from the women's recode file.

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A total of 5181 women of reproductive age were interviewed during the 2019 GMIS. This study focused on women who were not exposed to the "Goodlife Campaign," which, seeks to educate the public about malaria prevention. Considering that exposure to malaria prevention education can influence vaccine acceptance, this study focused on the unexposed subgroups to identify gaps in awareness and inform strategies for future malaria prevention campaigns.

The participants were asked, "In the past six months, have you seen/heard any of the following malaria messages on television or radio?" A total of 2264 participants who answered "no" were excluded from this study. Those who answered "yes" were asked a follow-up question whether "they have seen/heard about the Goodlife campaign recommending pregnant women to sleep under treated bed nets?" A total of 2193 participants who had seen/heard about the GLC on television, radio, or newspaper were excluded from this analysis. Therefore, data from 724 (unweighted) or 730 (weighted) women who had not been exposed to the GLC were included in this analysis (Figure 1).

Study variables

The outcome variable of interest in this study was the willingness to accept the malaria vaccine for children. The question "Would you allow your child to be vaccinated against malaria?" was asked, and the responses included "yes = 1", "no = 2", and "don't know = 8". The responses were recoded (yes = 1 and no = 0) for this analysis. For logistic regression analysis, "No" (n = 51) and "Don't know" (n = 37) responses were combined into a single category to represent the absence of the outcome or affirmative knowledge. This approach is conceptually appropriate as both responses indicate a lack of knowledge or non-acceptance, improve statistical power, and are consistent with prior DHS analyses [19,20,21].

The independent variable in this study was the sex of the household head, coded as male = 1 and female = 2. This was derived from the "sex" field of the person listed as "head of household in the household roster. The covariates included the age of the respondents, categorised as 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49 years, and awareness of the malaria vaccine (yes = 1, no = 2, and don't know = 8). Additionally, the educational status (no education = 1, primary = 2, secondary = 3, and higher = 4) of the respondent and household wealth index (poorest = 1, poor = 2, middle = 3, richer = 4 and richest = 5) were included in this analysis. The analysis included place of residence (urban = 1; rural = 2) and the number of children ever born (zero children = 1; 1-3 children = 2; 4-15 children = 3). Other covariates include awareness of malaria treatment covered by NHIS (Are you aware that malaria care is covered under the NHIS?), all coded as No = 1 and Yes = 2. Perceived susceptibility to malaria (When a child has a fever, you almost always worry it might be malaria) and perceived severity of malaria (You don't worry about malaria because it can be easily treated) were included as covariates, coded as "agree =1", "disagree = 2", and "don't know = 8". The predictors were selected based on the literature, dataset availability, and the absence of missing data.

Data analysis

The statistical analysis was done using Stata/SE version 17. The data were analysed at two levels, including univariate and multivariate. At the univariate level, descriptive statistics, including frequencies and percentages, were used to analyse participant characteristics, willingness to accept, and awareness of the malaria vaccine. Two models, including crude and adjusted binary logistic regression, were computed at the multivariable level to identify significant predictors of willingness to accept the malaria vaccine. Predictors that were statistically significant at the crude level were included in the adjusted analysis. This improved model parsimony, reduced noise, and avoided overfitting. Clustering, stratification, and sample weight were adjusted using the 'SVY' command. We used the primary sampling unit (v021), sample strata (v022), and individual sample weight (v005) for the adjustment. The DHS Program recommends adjusting for sampling weights to account for oversampling in some clusters. All descriptive statistics and regression models were conducted using the SVY prefix in Stata to account for the complex survey design. Standard errors were calculated using the default method in Stata, and degrees of freedom were derived from the number of PSUs minus the number of strata, consistent with DHS survey methodology. The odds ratios were reported with 95% confidence intervals and a 0.05 significance level. Ethical approval was not required

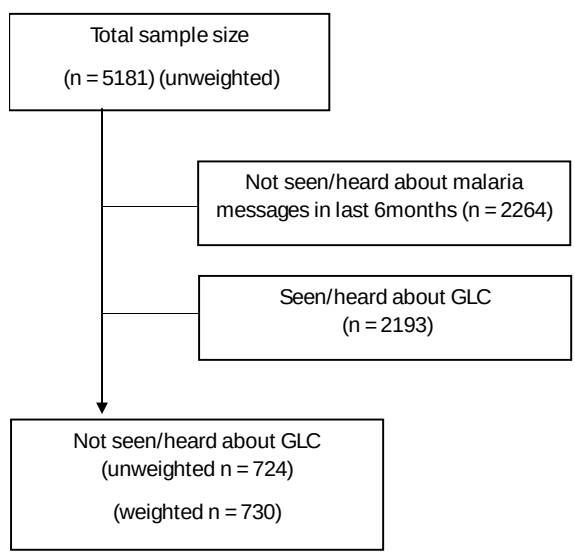

Figure 1: Flow diagram for sample size

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for this study because the data were secondary. However, it is important to note that participation in GMIS was voluntary, and informed consent was obtained from participants.

RESULTS

The results showed that three in ten participants (36%) had heard about the malaria vaccine for children, while 87.9% indicated they would allow their child to be vaccinated against malaria. Regarding participant characteristics, 21.8% were adolescents (aged 15-19 years), and 19.4% were in the poorest wealth index. Most participants had completed secondary school (56.5%) and professed Christianity (78.6%). More than half of the participants (53.8%) resided in rural areas, 23.2% in the Ashanti region, and 32.4% were nulliparous. Most (59.8%) of the participants were from male-headed households, and seven out of ten (70.2%) knew that malaria treatment was covered by the National Health Insurance Scheme (NHIS). The majority of participants (72.9%) reported worrying about malaria when their children have a fever. In comparison, 53.9% indicated they do not worry about malaria because it is treatable. It should be noted that cells with lower counts may yield unstable estimates; therefore, these results should be interpreted with caution (Table 1).

Determinants of willingness to accept malaria vaccine among participants

The crude logistic regression analysis showed that willingness to accept the malaria vaccine for children was significantly associated with the sex of the household head, awareness of the vaccine, wealth index, professing traditional religion, having 4 - 15 children, region, knowing that malaria is covered by NHIS, and perceived severity of malaria infection. For instance, participants in female-headed households were 2.23 times more willing to accept the malaria vaccine than those in male-headed households (COR = 2.23, 95% CI: 1.05 - 4.75). Participants who had heard about the malaria vaccine (COR = 2.32, 95% CI: 1.04-5.17) had higher odds of willingness than those without such knowledge. However, participants in the richest wealth index (COR = 0.28, 95% CI: 0.10 - 0.81) had reduced odds of willingness to accept the vaccine compared to those in the poorest wealth index (Table 2).

Variables that were statistically significant at the crude level were included in the adjusted model. In the adjusted analysis, the sex of the household head, professing

Table 1. Characteristics of participants

Variables	Unweighted n	Weighted n (%)
Willingness to accept of malaria vaccine		
No	67	88(12.1)
Yes	657	642(87.9)
Total	724	730(100)
Heard of malaria vaccine		
No	448	467(64.0)
Yes	276	263(36.0)
Total	724	730(100)
Age of respondent		
15-19	146	159(21.8)
20-24	127	131(18.0)
25-29	136	148(20.2)
30-34	86	72(9.8)
35-39	86	81(11.1)
40-44	68	64(8.8)
45-49	75	75(10.3)
Total	724	730(100)
Educational status		
No education	163	126(17.3)
Primary	142	151(20.7)
Secondary	383	413(56.5)
Higher	36	40(5.5)
Total	724	730(100)
Wealth index		
Poorest	220	142(19.4)
Poorer	142	156(21.4)
Middle	137	162(22.3)
Richer	111	126(17.2)
Richest	114	144(19.7)
Total	724	730(100)

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traditional religion, residing in the Ashanti and Central regions, and awareness that NHIS covers malaria were statistically significant predictors of willingness to accept the malaria vaccine. For example, participants in female-headed households (AOR = 2.03, 95% CI: 1.02 - 4.02), those who professed other religion (AOR = 5.98, 95% CI: 1.11 - 32.03), and those in the Ashanti region (AOR = 10.50, 95% CI: 1.83 - 60.20) and Central region (AOR = 2.85, 95% CI: 1.04 - 7.78) were more willing to accept the malaria vaccine. In addition, participants who knew that malaria is covered by NHIS (AOR = 2.86, 95% CI: 1.62 - 5.07) had increased odds of willingness to accept the malaria vaccine (Table 2). The logistic regression model demonstrated a moderate explanatory power, with a Pseudo R^2 (Nagelkerke) of 0.222, indicating that the predictors accounted for approximately 22% of the variation in willingness to accept the malaria vaccine. The Hosmer–Lemeshow test supported good model fit ($\chi^2 = 7.13$, df = 8, p = 0.5229). Assessment of multicollinearity using the variance inflation factor (VIF) showed a maximum value below 5, suggesting no evidence of collinearity among the independent variables.

Table 1. Cont.

Variables	Unweighted n	Weighted n (%)
Religion		
Christianity	548	574(78.6)
Islam	143	128(17.6)
Others	33	28(3.8)
Total	724	730(100)
Parity		
None	210	236(32.4)
1-3	284	286(39.2)
4-15	230	208(28.4)
Total	724	730(100)
Place of residence		
Urban	307	337(46.2)
Rural	417	393(53.8)
Total	724	730(100)
Region		
Western	85	92(12.6)
Central	48	40(5.4)
Greater Accra	63	99(13.6)
Volta	57	81(11.1)
Eastern	70	80(10.9)
Ashanti	111	169(23.2)
Brong Ahafo	71	60(8.2)
Northern	65	53(7.2)
Upper East	88	38(5.3)
Upper West	66	18(2.5)
Total	724	730(100)
Sex of household head		
Male	448	437(59.8)
Female	276	293(40.2)
Total	724	730(100)
Aware malaria is covered by NHIS		
No	201	218(29.8)
Yes	523	512(70.2)
Total	724	730(100)
Always worry about malaria when child has fever		
Disagree	176	168(23.0)
Agree	524	532(72.9)
Don’t know	24	30(4.1)
Total	724	730(100)
Don't worry about malaria, it can be easily treated		
Disagree	316	325(44.4)
Agree	396	393(53.9)
Don’t know	12	12(1.7)
Total	724	730(100)

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Table 2. Crude and adjusted logistic regression of factors associated with willingness to accept the malaria vaccine

Characteristic	COR (95% CI)	p-value	AOR (95% CI)	p-value
Sex of household head				
Male	Ref		Ref	
Female	2.23(1.05-4.75)	0.037	2.03(1.02-4.02)	0.041
Heard of malaria vaccine				
No	Ref		Ref	
Yes	2.32(1.04-5.17)	0.039	1.45(0.69-3.04)	0.312
Age of respondent				
15-19	Ref			
20-24	1.05(0.51-2.14)	0.891		
25-29	2.25(0.49-10.20)	0.290		
30-34	1.64(0.47-5.66)	0.428		
35-39	3.47(0.88-13.55)	0.073		
40-44	2.62(0.63-10.80)	0.179		
45-49	1.75(0.45-6.80)	0.414		
Educational status				
No education	Ref			
Primary	0.88(0.22-3.43)	0.855		
Secondary	0.62(0.26-1.44)	0.271		
Higher	0.38(0.08-1.69)	0.205		
Wealth index				
Poorest	Ref		Ref	
Poorer	0.44(0.13-1.40)	0.167	0.49(0.15-1.60)	0.237
Middle	0.25(0.08-0.77)	0.017	0.35(0.10-1.23)	0.103
Richer	0.29(0.11-0.80)	0.017	0.41(0.10-1.59)	0.196
Richest	0.28(0.10-0.81)	0.019	0.53(0.14-1.92)	0.334
Religion				
Christianity	Ref		Ref	
Islam	1.64(0.71-3.80)	0.242	1.82(0.91-3.61)	0.085
Others(traditional)	5.16(1.07-24.68)	0.040	5.98(1.11-32.03)	0.037
Parity				
None	Ref		Ref	
1-3	1.30(0.62-2.73)	0.484	1.74(0.82-3.67)	0.141
4-15	2.90(1.06-7.90)	0.037	2.36(0.93-4.59)	0.068
Place of residence				
Urban	Ref			
Rural	1.24(0.49-3.13)	0.640		
Region				
Greater Accra	Ref		Ref	
Western	2.02(0.90-4.54)	0.085	2.03(0.87-4.72)	0.097
Central	2.55(0.99-6.58)	0.052	2.85(1.04-7.78)	0.040
Volta	1.05(0.20-5.49)	0.951	0.69(0.64-2.95)	0.622
Eastern	3.52(0.88-14.01)	0.074	2.63(0.61-11.39)	0.193
Ashanti	15.46(2.90-82.40)	0.001	10.50(1.83-60.20)	0.009
Brong Ahafo	15.17(1.86-123.53)	0.011	7.33(0.78-68.85)	0.081
Northern	8.69(2.51-30.07)	0.001	3.79(0.81-17.69)	0.089
Upper East	4.72(1.62-13.77)	0.005	1.73(0.47-6.38)	0.405
Upper West	5.75(1.36-24.22)	0.017	2.23(0.42-11.74)	0.340
Malaria is covered by NHIS				
No	Ref		Ref	
Yes	3.63(2.02-6.52)	< 0.001	2.86(1.62-5.07)	< 0.001
Always worry about malaria when child has fever (perceived susceptibility				
Disagree	Ref			
Agree	2.00(1.00-3.97)	0.047		
Don't know	0.30(0.09-1.02)	0.054		
Don't worry about malaria; it can be easily treated (perceived severity)				
Disagree	Ref		Ref	
Agree	0.80(0.45-1.40)	0.442	0.88(0.45-1.69)	0.704
Don’t know	0.10(0.2-0.45)	0.003	0.33(0.08-1.28)	0.112

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DISCUSSION

In this present study, 88% of the participants were willing to accept the malaria vaccine. While previous studies have largely examined willingness to accept the malaria vaccine in general populations, our study focuses on women with no exposure to the GLC, thereby providing nuanced insights that may not be captured in general population analyses. By doing so, our findings extend the literature by identifying context-specific patterns and determinants that are particularly relevant for designing targeted interventions for women who are not reached with malaria BCC initiatives. The rate of willingness in this study is lower than the rate (95%) among women with children under five years [19]. Again, the finding in this study is higher than the willingness rate reported among caregivers in Guinea (76%) and Sierra Leone (81%) [20]. This could be attributed to differences in contextual factors such as malaria control strategies and initiatives. Ghana is one of the first countries in Africa to adopt malaria vaccination into the national immunisation programme [2]. The implications are that a considerable number of children born to women with no exposure to BCC initiatives may not be vaccinated against malaria, hence increasing their risk of malaria morbidity and mortality.

Another important finding was that women in female-headed households were more willing to accept the malaria vaccine than those in male-headed households. This finding is expected, as women in female-headed households may have greater decision-making autonomy. Without the need for a male partner's approval, decision on preventive health services such as vaccines are quickly made. Additionally, evidence shows that women with a female household head have better health-seeking behaviours [22]. This is partly because female heads are primarily caregivers and managers of family well-being, hence may prioritise preventive care over curative care. This may further facilitate acceptance of preventive interventions such as vaccines. This finding contradicts earlier studies among caregivers of children under five years in Ghana, which found no significant relationship [19,21]. There are several plausible explanations for the differences observed—for example, prior studies [19,21] did not report subgroup differences and focused on all women, including those with positive exposure status. The differences between this study's findings and existing research highlight the importance of disaggregating data in health research. Findings from our study highlight a nuanced understanding of the role of gender dynamics in household leadership in malaria vaccine acceptance.

Going forward, stakeholders, such as the Ghana Health Service, should enlist female household heads as champions of community-based malaria vaccine education campaigns, who will share their success stories to inspire and build public trust in the malaria vaccine. Furthermore, interventions to increase willingness to accept the malaria vaccine may consider women in male-headed households, since the observational nature of the study precludes causal inference.

Women who professed Christianity were less willing to accept the malaria vaccine as previously reported by other investigators [19]. However, the finding contradicts another study that found no significant association between religion and willingness to receive a malaria vaccine uptake [21]. These contradictory results may be explained by the fact that this study focused on women who were not exposed to the GLC initiative. Another possible explanation is that some Christian groups may prioritise divine protection and healing over medicine. Again, some religious sects perceived global health initiatives as a threat to religious beliefs and values, leading to distrust in public health solutions [23]. Consistent with literature, women who knew that the NHIS covered malaria treatment were more willing to accept the malaria vaccine [21]. These women may have better health literacy, which might translate into a better understanding of the benefits of the malaria vaccine, thereby increasing their willingness to accept it. This result suggests that incorporating malaria vaccine awareness into health insurance programmes could be a cost-effective strategy to improve vaccine acceptance and uptake in Ghana.

Another important finding is the observed regional variation in willingness to accept the malaria vaccine. For instance, women in the Ashanti region had higher odds of being willing to accept the vaccine than those in the Greater Accra region. The observed differences might be driven by unmeasured contextual factors, such as variation in community trust in public health interventions, exposure to malaria vaccine campaigns and variations in perceived susceptibility and care-seeking behaviours. Notably the Greater Accra region recorded the highest prevalence of care-seeking for children under five presenting with malaria symptoms such as fever [24]. Women in this region may perceive malaria as a condition that can be effectively managed with available treatment, which could reduce the perceived severity of malaria and the need for vaccination as a preventive measure. However, this result should be interpreted with caution, given the relatively wide confidence intervals, which suggest reduced precision of the estimates.

Although the crude analysis showed a significant association between knowledge of the malaria vaccine and willingness to accept it, this association became non-significant after adjustment. This suggests that awareness may indirectly influence willingness, potentially through factors such as financial and geographic access to malaria vaccines. This finding highlights that malaria campaign strategies should in addition to raising awareness also focus on strengthening the health system, including the availability and accessibility of vaccination services.

Implications of findings and recommendations

These findings have several implications for policy, research, and programming. The fact that a significant

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minority of the women were not willing to accept the malaria vaccine raises a public health concern. This requires the urgent attention of the leaders of the National Malaria Elimination Programme and the Ghana Health Service to adopt measures to increase caregivers' willingness to accept the malaria vaccine. Unvaccinated children may be at a higher risk of malaria morbidity and death or may require hospitalisation, thus exerting significant demand on the limited healthcare facilities and workers, or contributing to catastrophic healthcare spending among caregivers. Going forward, interventions geared towards increasing willingness to accept malaria vaccine among Ghanaian women without exposure to GLC would have to prioritise those living in male-headed households, Christians, and those with a limited understanding of the NHIS.

Strengths and limitations of the study

This present study specifically examines gender dynamics of caregivers' intentions to accept the malaria vaccine for children under five, addressing a critical gap in the literature. In addition, the study uses nationally representative data collected using standardised, rigorous methodologies, ensuring high data quality and reliability. This study, however, is not devoid of limitations. For instance, there is potential selection bias from excluding women exposed to GLC, which may limit the generalizability of the findings. Additionally, the measure of willingness was self-reported, which may have introduced social desirability bias. Again, the 2019 GMIS did not assess actual uptake; therefore, the outcomes reflect intentions rather than behaviour. In addition, we were unable to adjust for variables related to partner or household decision-making dynamics, media exposure, and prior vaccination behaviour due to data constraints. Further, some estimates have wide confidence intervals, reflecting potential instability; the findings should be interpreted with caution.

Conclusion

This study has demonstrated a relatively high willingness to accept the malaria vaccine. Willingness to accept the malaria vaccine was associated with having a female household head, awareness of malaria covered by NHIS, and professing traditional religion. This is the first study in Ghana to investigate willingness to accept the malaria vaccine among women with no exposure to malaria-related BCC initiatives. Therefore, a key policy priority is for stakeholders to design tailored interventions to increase malaria vaccine acceptance among women with little exposure to malaria-related programmes. This insight would help increase willingness to accept the malaria vaccine among women of reproductive age in Ghana.

DECLARATIONS

Ethical consideration

This study conducted secondary analyses using data from the Demographic and Health Survey (DHS) programme. DHS data collection methods are usually carried out in accordance with relevant guidelines and regulations, and ethical approval is obtained from the appropriate Institutional Review Boards in the respective countries. All participants provided written informed consent. The authors obtained permission from the DHS program to use the following data: https://dhsprogram.com/data/dataset/cfm.

Consent to publish

All authors agreed on the content of the final paper.

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Competing Interest

The authors declare no conflict of interest.

Author contribution

BKK, DA, DMB, AK, and IAK conceptualized the paper. BKK, DA, and EAA performed data acquisition and analysis. All seven authors (DA, BKK, EAA, AK, EA, DMB, and IAK) interpreted the data, while BKK, DA, EAA, and IAK drafted the paper. All seven authors (DA, BKK, DAA, AK, EA, DMB, and IAK) approved the paper for submission.

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Availability of data

Data is available upon request to the corresponding author

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