ejpmr, 2025, 12(7), 514-522

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

SJIF Impact Factor 7.065

Research Article

ISSN (O): 2394-3211

ISSN (P): 3051-2573

COMPLIANCE TO, AND PERCEPTION OF HEALTH STAFF ON THE EFFECTIVENESS OF THE MALARIA EXPANDED PROGRAMME ON IMMUNIZATION IN BAMENDA III HEALTH DISTRICT

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Article Received on 27/05/2025 **Article Revised on 16/06/2025** **Article Accepted on 06/07/2025**

ABSTRACT

Background: Malaria remains a leading cause of death and illness, especially among children under five in sub-Saharan Africa. In 2021 alone, 247 million cases and 619,000 deaths were reported globally, with Africa bearing 95% of the burden. In Cameroon, malaria accounts for 40% of childhood mortality and remains the top cause of morbidity. Despite interventions like insecticide-treated nets and indoor spraying, drug and insecticide resistance persist. The introduction of the RTS,S (Mosquirix) vaccine offers a promising addition to control efforts. The Expanded Programme on Immunization (EPI) plays a vital role in reducing malaria-related morbidity and mortality. However, its success depends on the compliance and perceptions of frontline health workers. Studies show that gaps exist in vaccine administration and record-keeping. In Bamenda III Health District, malaria remains endemic, with unique challenges like poor infrastructure and sociocultural factors. This research provides a first baseline assessment for Bamenda III. It aims to guide strategies to enhance EPI effectiveness and reduce malaria deaths in the region. **Methods**: A community based descriptive cross-sectional study design was used to assess the compliance to, and perception of 293 freely consented health staff on the effectiveness of the malaria EPI in the Bamenda III Health District, from the month of March - June 2024. The study respondents were sampled using a 3-stage sampling technique. Data was collected using a well-structured questionnaire divided into 4 sections, depending on the specific objectives of the study. Data was analysed using SPSS version 21. The Chi square (X^2) test and logistic regression analyses were used for inferential statistics. The tests were carried out at the sole probability of 0.05 and statistically significance differences were considered if p value was less than or equal to 0.05. **Results**: The study involved 293 health workers in Bamenda III Health District, predominantly female (77.5%) and nurses (73.4%), with 41.6% having less than one year of experience with the malaria EPI. About 71% of respondents strongly agreed that factors such as education, knowledge, in-service training, supervision, job aids, experience, and job satisfaction influence EPI compliance. Significant associations were found between work experience and education level affecting EPI understanding (p=0.031), and a positive correlation (r=+0.181, p=0.002) was observed between the variables. Job satisfaction's effect on compliance was significantly associated with gender (p=0.032), age (p=0.0001), work experience (p=0.0001), and religion (p=0.0001). Most respondents (71.7%) believed in the need for child vaccination, and 93.2% believed EPI reduces infections. Younger staff (18–22 years) were 0.43 times more likely (p=0.014) to support child vaccination, and those with less than 1-year experience were 3.23 times more likely (p=0.040). Up to 88.1% supported RTS,S vaccination. Challenges strongly agreed upon included poor logistics (63.5%), cold chain issues (62.8%), and insufficient infrastructure (60.4%). **Conclusion**: The study shows strong health staff agreement on key factors influencing compliance with malaria EPI guidelines. Significant associations between demographic factors and perceptions highlight the need for targeted staff support. Younger and less experienced staff were more likely to value child vaccination and EPI effectiveness. Major implementation challenges include poor logistics, cold chain failures, and limited infrastructure. Strengthening training, resources, and system support could enhance EPI impact in Bamenda III.

KEYWORDS: Compliance, Perception, Health Staff, EPI, Bamenda III Health District.

BACKGROUND

Malaria remains a leading cause of morbidity and mortality globally, with sub-Saharan Africa bearing the highest burden. In 2021, approximately 247 million cases and 619,000 deaths were recorded globally, with over 95% of cases occurring in Africa and more than 80% of the deaths affecting children under five years of age.[1,2] The disease is linked to severe complications like anemia, respiratory distress, and coma, and over 96% of malaria-related deaths occur in sub-Saharan Africa.[3,4]

Efforts to control malaria have relied on interventions such as insecticide-treated bed nets, indoor residual spraying, and antimalarial drugs. However, these methods are increasingly threatened by the rise of parasite and vector resistance to drugs and insecticides.[1,6] Innovations such as rapid diagnostic tools and the deployment of long-lasting insecticidal nets have helped reduce malaria cases[5], but more effective and sustainable tools are needed. Vaccination, notably with RTS,S (Mosquirix), presents a promising strategy to complement existing interventions and enhance control measures.[1,7]

The Expanded Programme on Immunization (EPI) has played a critical role in reducing the incidence of vaccine-preventable diseases, including malaria. It promotes the delivery of vaccines to children and pregnant women, aiming to reduce malaria-related mortality and morbidity. Effective implementation of the EPI depends not only on logistics and coverage but also on health staff's adherence to protocols and their perceptions of its effectiveness.[8]

Compliance to malaria EPI guidelines includes accurate vaccine administration, respect for immunization schedules, and diligent documentation.[8] A study by Ophori et al. in Nigeria found that while overall compliance was satisfactory, issues such as vaccine storage and handling, administration techniques, and record-keeping needed improvement.[9] These gaps emphasize the need to assess compliance levels in other regions, such as Bamenda III Health District, to identify local challenges and tailor solutions.

Health workers' perceptions significantly influence the success of immunization programs. A study in Ethiopia by Gebrehiwot et al. revealed that while health staff acknowledged the importance of the EPI, they faced challenges like vaccine shortages, insufficient training, and community resistance.[10] These perceptions affect their motivation and commitment, which in turn influence program outcomes. Thus, understanding local perspectives is essential for improving the malaria EPI.

Bamenda III, situated in a malaria-endemic zone, represents an ideal setting for evaluating the EPI's implementation. The district faces challenges such as weak infrastructure, resource limitations, and socio-cultural factors that could affect compliance and vaccine uptake. Conducting research in this area offer baseline data to inform local and national malaria control strategies and highlight areas needing intervention.

Malaria continues to severely affect Cameroon, with a prevalence rate of around 30% in 2020 and accounting for 2.7% of global malaria cases and deaths.[2] Despite government efforts—including free treatment for children under five and mass distribution of mosquito nets—malaria remains the top cause of child mortality. The EPI is expected to help reduce malaria's impact in Bamenda III. This research thus aims to assess health staff compliance and perceptions toward the EPI in Bamenda III to strengthen program implementation and reduce disease burden.

METHODS

Study Area and Design: This study was conducted in Bamenda III Health District, situated in the city of Bamenda, the regional capital of Cameroon's North West Region. The district is known for its diverse health infrastructure and varying perceptions about vaccine-based malaria interventions. Bamenda's unique topography and socio-cultural diversity make it a strategic location for public health research. A community-based cross-sectional study design was employed between March and June 2024 to assess health staff compliance and perceptions regarding the effectiveness of the malaria Expanded Program on Immunization (EPI).

Participants: The target population comprised all consenting health professionals across 21 health facilities in Bamenda III. These included doctors, nurses, midwives, laboratory technicians, pharmacists, and community health workers actively engaged in malaria EPI implementation. Participants were selected through a three-stage sampling technique involving random, convenience, and purposive approaches. Eligibility criteria required participants to be present during data collection and actively involved in EPI implementation. A total of 293 health staff were included in the study, calculated based on a single proportion estimation formula and adjusted for non-response.

Data Collection and Analysis: Data was collected using a pre-tested, structured questionnaire divided into four sections, covering socio-demographics, compliance factors, perception of EPI effectiveness, and implementation challenges. Questionnaires were either self-administered or interviewer-administered based on participant preference, taking approximately 15 minutes to complete. Additionally, in-depth interviews were conducted with 50% of the respondents for qualitative insights. Data was first coded and entered into Microsoft Excel 2013, then analysed using SPSS version 23. Descriptive statistics were presented as frequencies and percentages, while inferential analysis involved Chi-square tests and logistic regression at a significance level of $p \leq 0.05$. Ethical clearance was obtained from the

Regional Delegation of Public Health for the North West Region, and informed consent was secured from all participants.

RESULTS

Socio demographic data of study participants

Table 1 below presents the socio medical data of the study participants. Out of 293 respondents, majority were females accounting for a percentage score of 77.5% (n=227). Most of the respondents reported to be within the age range of 18-22years old (40.6%, n=119). From these 293 respondents, majority were nurses with a percentage score of 73.4% (n=215). With respect to the working experience, up to 41.6% (n=122) reported to have less than a year of working experience with the malaria EPI. A majority of these respondents also reported to be Catholics, accounting for a percentage score of 39.2% (n=115). This is shown in table 1 below.

Table 1: Socio demographic characteristics of study participants.

Variable	Categories	Frequencies	Percentages (%)
Gender	Male	66	22.5
	Female	227	77.5
Age range	18-22yrs	119	40.6
	23-27yrs	75	25.6
	28-32yrs	54	18.4
	33yrs and above	45	15.4
Qualification	MD	8	2.7
	Nurse	215	73.4
	Lab staff	36	12.3
	Administrator	3	1.0
	Others	31	10.6
Work experience	Less than 1yr	122	41.6
	1-2.9yrs	83	28.3
	3-5yrs	48	16.4
	Above 5yrs	40	13.7
Religion	Muslim	19	6.5
	Catholic	115	39.2
	Presbyterian	59	20.1
	Baptist	51	17.4
	Others	49	16.7

Factors that influence the compliance of health staff to the EPI guidelines for malaria prevention and control

The basic Likert scale table presented below indicates that majority of respondents reported to strongly agree on the fact that the level of education of staff affects staff understanding of EPI, that health workers knowledge affects staff level of compliance of EPI, that the staff level of compliance on EPI is affected by level of in-service training, that proper supervision of staff increases their level of compliance on EPI, that's availability of job aids help the health staff to better implement the EPI program and that health workers experience increases the rate of staff understanding of EPI. However, majority of these respondents agreed that job satisfaction affects staff level of compliance of EPI as shown in table 2 below.

Table 2: Likert scale table on factors that influence the compliance of health staff to the EPI guidelines for malaria prevention and control.

	N	Min	Max	Mean	SD
The level of education of staff affects staff understanding of EPI	293	.00	3.00	.3481	.64237
Health workers knowledge affects staff level of compliance of EPI	293	.00	3.00	.3481	.68868
Job satisfaction affects staff level of compliance of EPI	293	.00	3.00	1.0375	1.10817
The staff level of compliance on EPI is affected by level of in-service training	293	.00	2.00	.5017	.67552
Proper supervision of staff increases their level of compliance on EPI	293	.00	3.00	.5051	.65491
Availability of job aids help the health staff to better implement the EPI program	293	.00	2.00	.5290	.65429
Health workers experience increases the rate of staff understanding of EPI	293	.00	3.00	.6109	.70625

SD-Standard deviation

In summary, up to 71% (n=208) of respondents in this study strongly agreed that the above 7 factors influence compliance of health staff to the EPI guidelines for malaria prevention and control. Only 25% (n=74) agreed and only 3.8% (n=11) disagreed that the above 7 factors influence compliance of health staff to the EPI guidelines for malaria prevention and control as shown in figure 1 below.

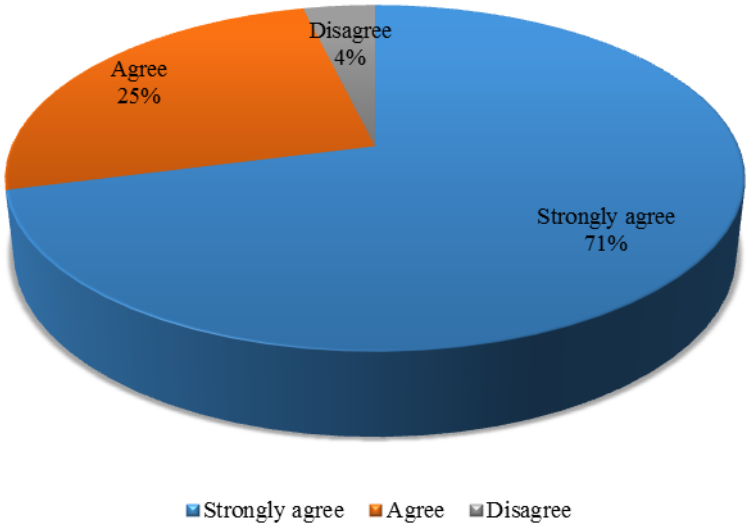

Figure 1: Summary presentation on respondents' responses on factors that influence the compliance of health staff to the EPI guidelines for malaria prevention and control.

Significant association between Factors that influence the compliance of health staff to the EPI guidelines for malaria prevention/control and socio demographics

A) Work experience versus the level of education of staff affecting staff understanding of EPI

There was a significant association between working experience of staff and their responses on if level of education of staff affects staff understanding of EPI (p=0.031, X^2=18.42). In fact, there was also a statistically significant positive correlation between work experience versus the level of education of staff affecting staff understanding of EPI (p=0.002, r=+0.181). we could see from figure 2 below that majority of those that strongly disagreed all had less than 1yr of working experience and majority of those that strongly agreed had above 5years of working experience.

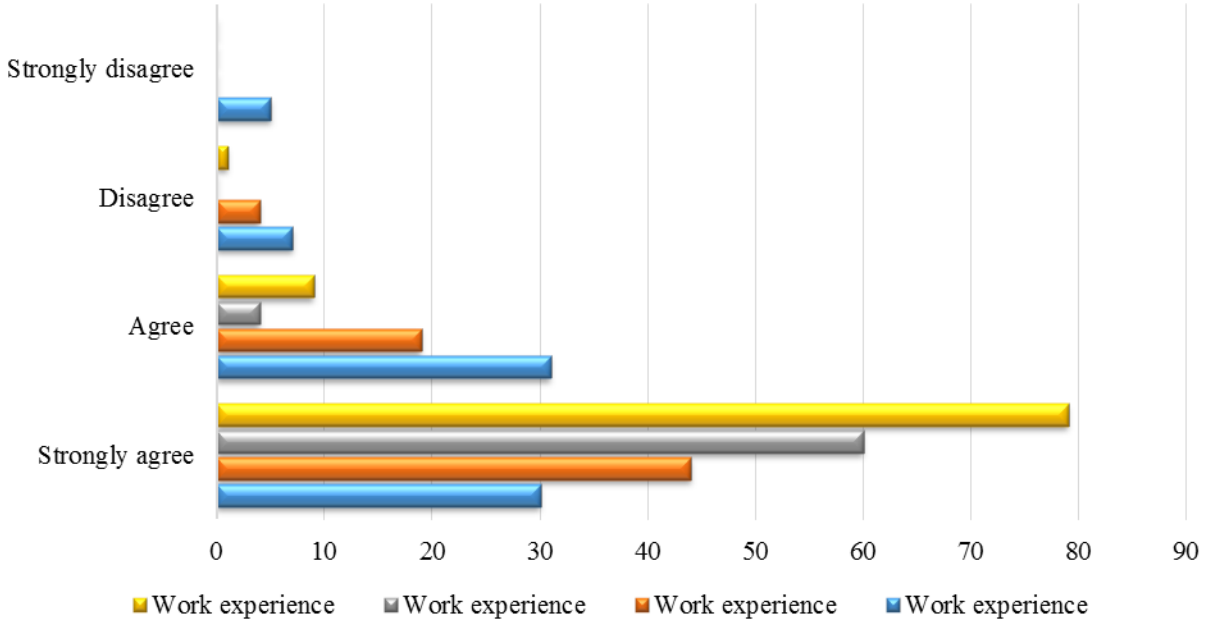

Figure 2: Work experience versus the level of education of staff affecting staff understanding of EPI.

There was a statistically significant association between responses of respondents on if Job satisfaction affects staff level of compliance of EPI and sociodemographic characteristics. Gender (p=0.032), age range (p=0.0001), work experience (p=0.0001) and religion (p=0.0001) were statistically associated with if Job satisfaction affects staff level of compliance of EPI as shown in table 3 below.

Table 3: Association between responses of respondents on if Job satisfaction affects staff level of compliance of EPI and sociodemographic characteristics.

Variable	Categories	Job satisfaction affects staff level of compliance of EPI				X^2 (P value)
		SA n(%)	A n(%)	D n(%)	SD n(%)	
Gender	Male	24 (8.20)	09 (3.10)	18 (6.10)	15 (5.10)	8.83
	Female	110 (37.5)	45 (15.4)	47 (16.0)	25 (8.5)	**(0.032)***
Age range	18-22yrs	61 (20.8)	21 (7.20)	29 (9.90)	8 (2.70)	
	23-27yrs	33 (11.3)	20 (6.8)	15 (5.10)	7 (2.40)	34.96
	28-32yrs	21 (7.20)	10 (3.4)	15 (5.10)	8 (2.70)	**(0.0001)***
	33yrs and above	19 (6.50)	3 (1.00)	6 (2.00)	17 (5.80)	
Qualification	MD	2 (0,70)	1 (0.30)	4 (1.40)	1 (0.30)	
	Nurse	97 (33.1)	40 (13.7)	48 (16.4)	30 (10.2)	13.86
	Lab staff	13 (4.40)	10 (3.40)	7 (2.40)	6 (2.00)	(0.310)
	Administrator	2 (0.70)	0 (0.00)	0 (0.00)	1 (0.30)	
	Others	20 (6.8)	3 (1.00)	6 (2.00)	2 (0.70)	
Work experience	Less than 1yr	61 (20.8)	34 (11.6)	21 (7.2)	6 (2.00)	41.85
	1-2.9yrs	41 (14.0)	13 (4.4)	16 (5.5)	13 (4.4)	**(0.0001)***
	3-5yrs	17 (5.8)	3 (1.00)	20 (6.8)	8 (2.70)	
	Above 5yrs	15 (5.1)	4 (1.40)	8 (2.70)	13 (4.4)	
Religion	Muslim	11 (3.8)	2 (0.70)	4 (1.40)	2 (0.70)	40.71
	Catholic	72 (24.6)	21 (7.2)	16 (5.5)	6 (2.00)	**(0.0001)***
	Presbyterian	23 (7.80)	12 (4.1)	15 (5.1)	9 (3.10)	
	Baptist	15 (5.10)	10 (3.4)	18 (6.1)	8 (2.70)	
	Others	13 (4.40)	9 (3.10)	12 (4.1)	15 (5.1)	

***-statistically significant at 0.05 significance level, SA-Strongly agree, A-Agree, D-Disagree, SD-Strongly disagree**

Perceptions of health staff on the effectiveness of the EPI interventions for malaria reduction and elimination in the Bamenda III Health District

Table 4 below presents the responses geared towards perception of health staff on the effectiveness of the EPI interventions for malaria reduction and elimination. A majority of 71.1% (n=210) reported that they believe that there is need for children to be vaccinated. 50.2% (n=147) reported that health staff do not have judgements on vaccines. 88.1% (n=158) reported that there are benefits of vaccinating children with RTSS against malaria and a majority of 93.2% (n=273) reported that EPI on malaria reduces the number of infected individuals.

Table 4: Perceptions of health staff on the effectiveness of the EPI interventions for malaria reduction and elimination.

	Yes n(%)	No n(%)
Do you believe that there is need for children to be vaccinated?	210 (71.7)	83 (28.3)
Are health staff having judgements on vaccines?	146 (49.8)	147 (50.2)
Are there benefits of vaccinating children with RTSS against malaria?	258 (88.1)	35 (11.9)
Can the EPI on malaria reduce the number of infected individuals?	273 (93.2)	20 (6.8)

Regression analysis between some perceptions and socio demographics of respondents

Comparing if respondents believed there is need for children to be vaccinated, table 5 below presents that there was a statistically significant association between age range, work experience and their responses if there is need for children to be vaccinated against malaria. With these significant variables, it shows that respondents between the age of 18-22yrs old were 0.43 times more likely to believe that there is need for children to be vaccinated compared to the other groups (p=0.14). This was the same thing noticed in respondents that have less than 1yr of working experience (p=0.04, OR = 3.23) as shown in table 5 below.

Table 5: Multivariate analysis between if respondents believe that there is need for children to be vaccinated versus socio demographics.

Do you believe that there is need for children to be vaccinated? [a]			B	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
						Lower Bound	Upper Bound
Yes		*Intercept*	*.772*	*.187*			
	Gender	Male	.327	.363	1.387	.685	2.810

		Female	*0*[b]	.	.	.	.
	Age range	18-22yrs	-.834	.014*	.434	.140	1.343
		23-27yrs	-.619	.281	.538	.175	1.660
		28-32yrs	.251	.672	1.28	.402	4.111
		33yrs and above	*0*[b]	.	.	.	.
	Qualification	MD	-1.239	.151	.290	.053	1.573
		Nurse	-.039	.934	.962	.384	2.412
		Lab staff	-.741	.201	.477	.153	1.483
		Administrator	18.862	.	1.55	1.55	1.558
		Others	*0*[b]	.	.	.	.
	Work experience	Less than 1yr	1.173	.040*	3.23	1.053	9.918
		1-2.9yrs	.913	.115	2.49	.801	7.742
		3-5yrs	-.113	.844	.893	.291	2.743
		Above 5yrs	*0*[b]	.	.	.	.

a. The reference category is: No. *-statistically significant at 0.05 statistical level
b. This parameter is set to zero because it is redundant.

Everything being equal, respondents between the ages of 18-22years and 23-27yrs were 7.68 and 6.9 times more likely to believe that EPI on malaria can reduce the number of infected individuals when compared to other groups (p = 0.0001). This was also noticed with respondents less than 1yr and between 1-2.9yrs of working experience (p=0.0001 each with OR = 3.7 and 9.1 respectively). This is presented in table 6 below.

Table 6: Multivariate analysis between if respondents believe that EPI on malaria can reduce the number of infected individuals versus socio demographics.

Can the EPI on malaria reduce the number of infected individuals? [a]			B	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
						Lower Bound	Upper Bound
Yes		*Intercept*	38.723	*.000*			
	Gender	Male	1.064	.209	2.899	.552	15.239
		Female	*0*[b]	.	.	.	.
	Age range	18-22yrs	-18.684	.000*	7.682	1.489	13.964
		23-27yrs	-18.788	.000*	6.924	1.531	12.131
		28-32yrs	-18.230	.	1.210	0.210	9.210
		33yrs and above	*0*[b]	.	.	.	.
	Qualification	MD	-.152	.911	.859	.060	12.353
		Nurse	.536	.522	1.708	.332	8.795
		Lab staff	-.493	.620	.611	.087	4.290
		Administrator	-21.033	.998	7.334	.000	.[c]
		Others	*0*[b]	.	.	.	.
	Work experience	Less than 1yr	-17.090	.000*	3.785	6.155	6.327
		1-2.9yrs	-18.516	.000*	9.089	1.920	12.302
		3-5yrs	-18.795	.	6.878	6.878	9.878
		Above 5yrs	*0*[b]	.	.	.	.

a. The reference category is: No. *-statistically significant at 0.05 statistical level
b. This parameter is set to zero because it is redundant.

Lastly, perceptions with respect to believes indicated that up to 48% (n=142) of respondents believed that the malaria vaccine has nothing to do with cultural or religious believes. Interestingly, 13.7% (n=40) reported that the malaria vaccine is believed to have a cultural effect, 8.9% (n=26) reported that the malaria vaccine is believed to have a religious effect. In fact, 29% (n=85) believed that the malaria vaccine is believed to have both cultural and religious effects.

However, there was no statistically significant association between the believes about the malaria vaccines and the religion of respondents (p= 0.915, X^2=6.01) as shown in figure 3 below.

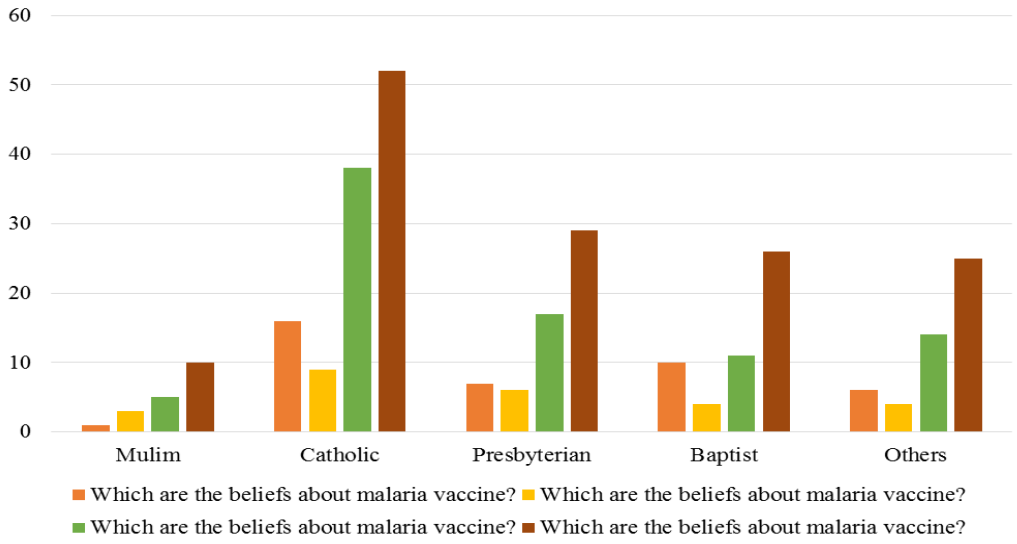

Figure 3: Association between believes about the malaria vaccines and the religion of respondents.

Challenges for enhancing the EPI implementation and management of EPI against malaria in the Bamenda III Health District

Table 7 below presents the challenges reported by respondents on the implementation and management of EPI against malaria in Bamenda. Amongst all questions asked with respect to challenges, majority of respondents reported by saying that they all agree that the questions posed are challenges to the implementation and management of EPI against malaria in Bamenda III health district.

Table 7: Challenges for enhancing the EPI implementation and management of EPI against malaria in the Bamenda III Health District.

	SA n(%)	A n(%)	D n(%)	SD n(%)
Insufficient healthcare infrastructure	177 (60.4)	92 (31.4)	21 (7.20)	03 (1.00)
Insufficient human resources	144 (49.1)	122 (41.6)	26 (8.90)	01 (0.30)
Weak health systems	100 (34.1)	71 (24.2)	81 (27.6)	41 (14.0)
Inadequate training of health workers	97 (33.1)	74 (25.3)	72 (24.6)	50 (17.1)
Lack of equipment and supplies	171 (58.4)	93 (31.7)	24 (8.20)	05 (1.70)
Limited surveillance systems	153 (52.2)	84 (28.7)	48 (16.4)	08 (2.70)
Cultural beliefs	144 (38.9)	64 (21.8)	93 (31.7)	22 (07.5)
Language barriers	124 (42.3)	48 (16.4)	100 (34.1)	21 (7.20)
Policy makers do not collaborate with field workers	163 (55.6)	63 (21.5)	47 (16.0)	20 (6.8)
Limited availability of vaccines against malaria	177 (60.4)	55 (18.8)	41 (14.0)	20 (6.80)
Difficulties to maintain the cold chain system	184 (62.8)	67 (22.9)	33 (11.3)	09 (3.10)
There is lack of clarity on whether to provide vaccination through fixed centers of mobile teams	171 (58.4)	22 (7.50)	100 (34.1)	00 (0.00)
There is lack of accurate population data	143 (48.8)	46 (15.7)	92 (31.4)	12 (4.10)
There is a problem of on ground logistics issues	186 (63.5)	47 (16.0)	48 (16.4)	12 (4.10)
There is lack of separate budget line for EPI	113 (38.6)	55 (18.8)	110 (37.7)	15 (5.10)
There is security risk of community-based activities	173 (59.0)	95 (32.4)	18 (6.10)	07 (2.40)
There is community misconception about the vaccine	158 (53.9)	113 (38.6)	17 (5.80)	05 (1.70)

SA-Strongly agree, A-Agree, D-Disagree, SD-Strongly

The highest was actually problems on logistics issues where up to 62.8% of respondents (n = 184) strongly agreed that it is really a problem faced in the implementation and management of EPI against malaria in Bamenda III health district. This was followed by difficulties in maintaining the cold chain with a percentage of 62.8%. the next challenge that followed was insufficient health infrastructure at 60.4%. All these challenges are presented in figure 4 below.

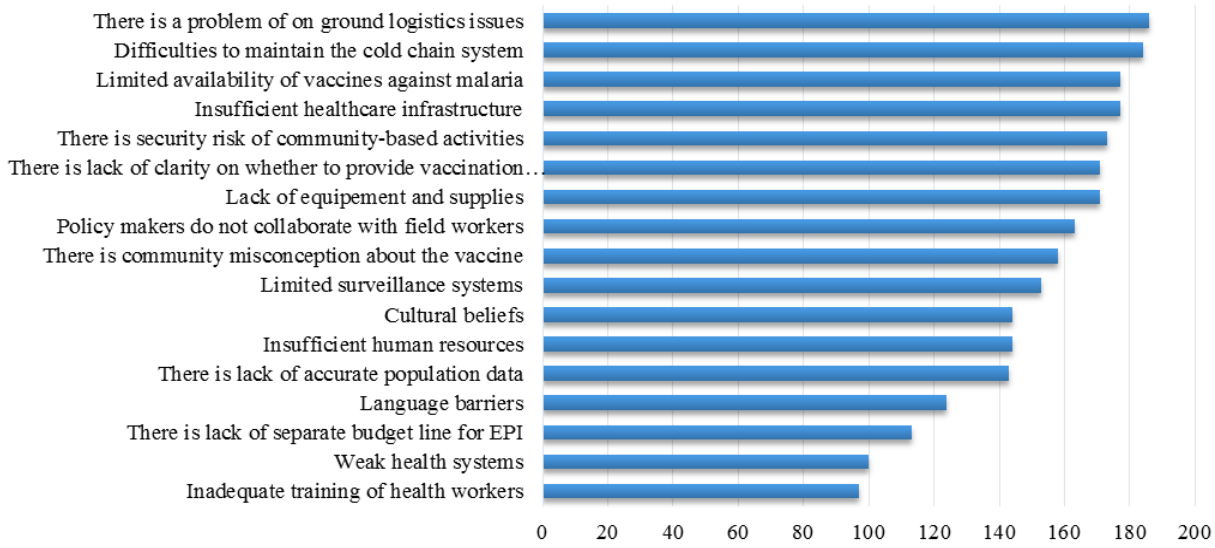

Figure 4: Strongly agreed challenges for enhancing the EPI implementation and management of EPI against malaria in the Bamenda III Health District.

DISCUSSION

In this study conducted in Bamenda III Health District, most participants were female (77.5%), with a dominant age group of 18–22 years (40.6%), and a majority being nurses (73.4%). This demographic profile contrasts with studies such as that by Adaugo and Macide, where males and older age groups predominated.[11] Additionally, 41.6% of respondents had less than one year of experience with malaria EPI. These findings underscore a younger, predominantly female, and relatively inexperienced workforce. The study also observed that respondents strongly agreed that seven factors—education, knowledge, in-service training, supervision, job aids, experience, and job satisfaction—significantly influence health staff compliance with EPI guidelines.

Training emerged as a key influencer of compliance, aligning with findings by Mohammed et al., who emphasized that in-service training enhances technical capacity and compliance with malaria EPI guidelines.[12] The study also revealed a statistically significant relationship between work experience and understanding of EPI guidelines ($p=0.03$), with a positive correlation ($r=+0.181$, $p=0.002$). Supervision was equally essential, as respondents who had been regularly supervised showed higher compliance, consistent with studies in Uganda and other African contexts.[11,13] These results reinforce the importance of ongoing professional development and oversight in enhancing frontline workers' adherence to EPI protocols.

Regarding perceptions, 71.1% of health workers agreed on the necessity of child vaccination, and 93.2% affirmed that EPI reduces malaria cases. Similar sentiments were reported in Nigeria, where over 80% of policy actors acknowledged the potential of malaria vaccines in controlling malaria.[11] The study found that younger respondents (18–22 years) and those with less than one year of experience were more likely to support vaccination ($p=0.14$ and $p=0.04$ respectively), echoing trends observed by previous researchers.[11,14] Cultural and religious influences were acknowledged, with 13.7% citing cultural effects and 8.9% citing religious effects, while 29% believed both had an impact. Similar findings on the influence of sociocultural beliefs on vaccine acceptance were reported in Ghana and Cyprus.[15]

Logistical issues posed the greatest challenge to malaria EPI implementation in Bamenda III, with 62.8% strongly agreeing on its impact, followed by cold chain management and poor health infrastructure (60.4%). Literature supports that even a vaccine with modest efficacy (30–50%) could be highly cost-effective in endemic regions.[16,17] However, successful integration into the EPI requires careful evaluation of vaccine compatibility with existing systems, including delivery capacity and cold chain infrastructure.[18] Additionally, cultural perceptions significantly influence vaccine acceptance, as supported by the Health Belief Model and studies across sub-Saharan Africa, which suggest a general recognition of malaria as a serious public health concern and openness to preventive vaccination.[19,20]

CONCLUSION

In conclusion, this research highlights critical insights into the compliance of health staff with malaria EPI guidelines and their perceptions of the program's effectiveness in the Bamenda III Health District. The findings demonstrate that factors such as education, training, supervision, and experience significantly influence adherence to EPI protocols. While most health workers support malaria vaccination, logistical constraints, cultural beliefs, and inadequate infrastructure remain major barriers to effective implementation. The implication of this research is that strengthening staff capacity through continuous training, improving

supervision mechanisms, and addressing logistical challenges are essential for enhancing the impact of malaria EPI in resource-limited settings. Policymakers and public health stakeholders should consider these findings when designing strategies to scale up vaccination programs and achieve sustained malaria control.

Author's contribution

LHS, Study conception and design, writing of the manuscript; KDS, Data collection and critical revision of the manuscript; LHS/KDS, Study design, supervision of data collection and critical revision of manuscript; LHS, Data analysis and critical revision of manuscript; AGN/SM/TLM, Study design, acquisition and interpretation of data, critical revision of manuscript; All authors gave their consent for publication. All authors read and approved the final manuscript.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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