

Research Article

# Exploring Information Sources on Malaria Prevention and Their Impact on Knowledge Among Pregnant Women in Urban Ghana

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## Abstract

**Background:** Adequate knowledge of malaria prevention among pregnant women is crucial for mitigating the associated risks. This study aimed to explore the various information sources on malaria preventive measures and assess their impact on the knowledge of malaria prevention among pregnant women in an urban district of Ghana. **Methods:** A cross-sectional study involving 300 pregnant women was conducted to evaluate their knowledge of malaria prevention. Chi-square tests were utilized to assess the relationships between these educational sources and levels of knowledge. To quantify the influence of each educational source on knowledge, logistic regression models were employed, providing adjusted odds ratios (AORs) with 95% confidence intervals (CIs). All analyses were conducted using Statistical Package for the Social Sciences (SPSS) version 20 and

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Microsoft Excel version 2026. Results: Overall, 88.7% of participants demonstrated adequate knowledge of malaria prevention. Education at health posts by trained workers was linked to higher knowledge (AOR = 7.82, 95% CI [1.26, 48.35],  $p = 0.027$ ). In contrast, education from family or friends was associated with lower knowledge levels (AOR = 0.34, 95% CI [0.15, 0.76],  $p = 0.008$ ). Media and written materials did not significantly affect knowledge levels ( $\chi^2$  (1,  $N = 300$ ) = 0.44,  $p = 0.51$ ). Conclusion: The findings highlight the pivotal role of health posts and health workers in enhancing malaria prevention knowledge among pregnant women. Strategies aimed at strengthening health facility-based education could significantly improve maternal health outcomes in malaria-endemic regions. Further research is recommended to explore effective approaches for augmenting education from family networks and media to complement health facility-based efforts.

## Keywords

Malaria Prevention, Pregnancy, Information Sources, Healthcare Providers, Social Networks, Mass Media

## 1. Introduction

Malaria remains a severe threat to pregnant women, especially in sub-Saharan Africa [1, 2]. Pregnant women are more susceptible to severe forms of malaria, such as placental malaria, due to physiological changes during pregnancy [3, 4]. This condition can lead to serious complications like maternal anaemia, low birth weight, and even maternal mortality [5-7]. The high malaria burden in Ghana highlights the urgent need for effective prevention strategies targeted at pregnant women [8].

Health education is crucial for malaria prevention among pregnant women. Understanding malaria transmission, symptoms, and preventive measures such as using insecticide-treated bed nets (ITNs), following intermittent preventive treatment in pregnancy (IPTp), and seeking prompt treatment can significantly reduce malaria's impact [9]. Studies show that well-informed pregnant women are more likely to use preventive measures, which decreases malaria-related complications [10].

The effectiveness of health education depends on the sources of information. In Ghana, information comes from healthcare providers, community health workers, and mass media. Each source has strengths and limitations. Healthcare providers and community health workers offer personalized advice, while mass media can reach a broad audience but may not provide detailed guidance [11].

Urban areas, such as Asunafo North, pose unique challenges for malaria prevention. The complexities of urban environments such as varying healthcare access, fragmented information dissemination, and diverse community dynamics can affect how effectively health education reaches pregnant women. Integrating information across multiple channels is often necessary in urban settings to ensure widespread understanding and adoption of preventive measures.

Despite the importance of these factors, there is a notable gap in research on how different sources of malaria prevention education impact pregnant women in urban settings. Existing studies have explored malaria prevention among pregnant women [5, 10, 12], but few have specifically ex-

amined how various information sources affect malaria knowledge in urban districts like Asunafo North. Addressing this gap is essential for developing targeted interventions and improving malaria prevention strategies for pregnant women in urban areas.

Malaria remains a critical public health issue worldwide, particularly in sub-Saharan Africa, where it significantly affects vulnerable populations such as pregnant women [1, 3, 13]. Despite various interventions aimed at reducing malaria's prevalence and impact, it continues to pose a major health challenge in Ghana [8]. Pregnant women are especially vulnerable to malaria due to physiological changes that weaken their immune systems, making them more susceptible to severe forms of the disease, including placental malaria [5]. This condition can result in adverse pregnancy outcomes such as maternal anaemia, low birth weight, and even maternal mortality [6].

Most regions of West Africa like Ghana, experience substantial malaria transmission throughout the year. The prevalence of malaria varies by region and is influenced by climate, geography, and socioeconomic factors [14]. According to the [2], Ghana represents a significant proportion of malaria cases and deaths in West Africa, underscoring the urgent need for effective prevention and control measures, particularly for vulnerable groups like pregnant women.

Pregnant women are at heightened risk for malaria due to the physiological changes during pregnancy that affect their immune response to the malaria parasite. *Plasmodium falciparum*, the primary malaria parasite in Ghana, can sequester in the placenta, leading to placental malaria with severe consequences for both the mother and the fetus [4, 5]. Malaria during pregnancy can result in maternal anaemia, intrauterine growth restriction, preterm birth, and increased infant mortality [7].

Effective malaria prevention and control among pregnant women heavily rely on their knowledge and awareness of preventive measures [11]. Understanding malaria transmission, symptoms, and preventive strategies such as the use of

insecticide-treated bed nets (ITNs), intermittent preventive treatment in pregnancy (IPTp), and prompt treatment with antimalarial drugs is essential for reducing malaria-related morbidity and mortality [9]. Research indicates that adequate knowledge among pregnant women leads to better adherence to preventive measures, thereby decreasing the incidence and severity of malaria during pregnancy [10].

The effectiveness of malaria prevention efforts among pregnant women is influenced by the sources from which they receive information. In urban settings in Ghana, common sources include healthcare providers, community health workers, mass media (such as radio and television), and interpersonal communication within communities. The accuracy and timeliness of information from these sources can significantly affect the adoption of preventive measures and help reduce malaria-related complications.

Despite numerous studies on malaria prevention among pregnant women [5, 10, 12], there is a lack of research on how different sources of prevention education affect malaria knowledge in urban districts such as Asunafo North. Urban environments present unique challenges and opportunities compared to rural areas, including variations in healthcare access, information dissemination, and community dynamics. Investigating how various information sources impact malaria prevention knowledge in urban settings is essential for developing targeted interventions to improve maternal health outcomes effectively.

## 2. Materials and Methods

### 2.1. Study Setting

This study was conducted in the Asunafo North Municipality, located in the Ahafo Region of Ghana. Goaso, the regional capital, serves as the administrative centre. Established in 2018, the Asunafo North Municipality is bordered by the Tano North Municipality to the north, the Asutifi North District to the east, the Asunafo South Municipality to the south, and the Bia East District in the Western Region to the west. Local FM radio stations, including Nananom FM, Genesis FM, Success FM, and Hammers Radio, provide important communication channels for health information. Within the municipality, approximately eight of the twenty health facilities offer antenatal care (ANC), delivery, and post-partum services. These facilities serve both the municipality's residents and those from neighbouring communities, forming the study's catchment area.

### 2.2. Study Design

This study employed a cross-sectional design to explore the sources of information on malaria preventive measures and their impact on malaria prevention knowledge among pregnant women in an urban district of Ghana.

### 2.3. Study Population

The study focused on pregnant women residing in the Asunafo North District who were receiving ANC services at health facilities within the district.

### 2.4. Inclusion Criteria

Pregnant women residing in the Asunafo North District, who were receiving antenatal care ANC at one of the eight selected health facilities, and who provided informed consent to participate were included in the study.

### 2.5. Exclusion Criteria

Pregnant women residing in the Asunafo North District, receiving ANC at one of the eight selected health facilities, were excluded if they did not provide informed consent or had severe health conditions that could impede their participation or affect their well-being.

### 2.6. Sample Size Calculation

The sample size for this study was calculated using Yamane's formula:

$$n = \frac{N}{1+N(e)^2}$$

In this formula,  $n$  represents the required sample size,  $N$  is the total population, and  $e$  denotes the acceptable margin of error. For this study, the margin of error was set at 0.05, or 5%. The population of interest comprised pregnant women attending antenatal clinics and maternity wards in the district, which was recorded as 991 in 2019. Applying Yamane's formula with these parameters, the initial calculation yielded a sample size of 285.

To ensure that the final sample size would adequately account for potential non-responses and maintain the study's statistical power, an adjustment was made. Specifically, a 5% non-response rate was anticipated. Therefore, the final sample size was increased to 300 to compensate for this anticipated non-response and to ensure the robustness of the study results. This adjustment was made to mitigate the risk of insufficient sample size and to enhance the reliability and validity of the study's findings.

### 2.7. Sampling Procedure

The study purposefully included all eight health facilities in the municipality that provide antenatal care (ANC) to ensure comprehensive coverage of available services. A stratified random sampling method was employed to determine the final sample size. Each health facility offering ANC was designated as a separate stratum, resulting in eight distinct strata. The sample size for each stratum was calculated by

determining the proportion of the study population served by each facility and applying this proportion to the overall sample size of 300 participants. Within each facility, participants were selected through a simple random sampling technique. For this process, 300 slips marked 'Yes' and 300 slips marked 'No' were prepared and placed into a container, which was then thoroughly mixed to ensure randomness. Participants who consented to take part in the study were asked to draw a slip from the container without seeing its content. Those who drew a slip marked 'Yes' were included in the study sample, while those who drew a slip marked 'No' were excluded from participation. To maintain the integrity of the randomization process, each drawn slip was discarded immediately and not returned to the container, thereby ensuring that each draw remained independent and random. This approach facilitated an unbiased selection of participants from each stratum, aligning with the study's objective of obtaining a representative sample across all facilities.

## 2.8. Data Collection Tool and Procedure

Between August 3 and November 30, 2020, a structured questionnaire was employed to gather quantitative data from pregnant women. This questionnaire, meticulously pretested and researcher-administered, was used to ensure accurate data collection. Trained research assistants administered the questionnaires during antenatal clinic visits to capture a comprehensive range of information. The questionnaire comprised several sections designed to gather detailed data on demographic characteristics, sources of information about malaria preventive measures, and knowledge related to malaria susceptibility, severity, and prevention during pregnancy. Before the full-scale data collection, the questionnaire underwent an extensive pretesting phase involving a pilot study with a small, representative sample of participants. This pretesting aimed to evaluate and refine the questionnaire's clarity, flow, and overall structure. Feedback from the pilot study led to necessary revisions to enhance the questionnaire's clarity, coherence, and effectiveness. The questionnaire was also adapted for cultural relevance and language to ensure that it was understandable and applicable to the participants, minimizing the risk of misinterpretation. To ensure the reliability of the data collected, a test-retest method was employed. A subgroup of respondents completed the questionnaire at different intervals to assess the consistency of their responses over time. Items that showed inconsistencies were reviewed and adjusted to improve the reliability of the instrument. This rigorous approach ensured that the data collected were both accurate and dependable, providing a solid foundation for subsequent analysis.

## 2.9. Variables Studied

### 2.9.1. Demographic Characteristics

The study assessed various demographic characteristics of participants to better understand their profiles. Age was cat-

egorized into three groups: under 20 years, 20 to 35 years, and over 35 years. Occupation was classified into three categories: self-employed, unemployed, and salaried workers. Marital status was categorized as cohabiting, married, separated/widowed, or single. Educational attainment was divided into four levels: basic, non-formal, secondary/vocational, and tertiary. Religion was primarily classified into two groups: Christianity and Islam. Additionally, gestational age was categorized into two groups: less than 16 weeks and 16 weeks or more.

### 2.9.2. Sources of Information on Malaria Preventive Measures

The study investigated how pregnant women receive education and information about malaria prevention during pregnancy, focusing on three main sources. First, Health Posts, where health workers offer crucial guidance on prevention and treatment. Second, Family and Friends, highlighting the influence of personal networks and informal channels. Third, Media and Written Materials, which include information from television, radio, billboards, as well as pamphlets, brochures, fact sheets, and leaflets. These diverse sources collectively contribute to shaping pregnant women's knowledge and practices regarding malaria prevention.

### 2.9.3. Knowledge of Malaria Preventive Measures

The study assessed participants' knowledge of malaria preventive measures through a structured questionnaire focusing on three key areas. Susceptibility was evaluated using four questions to gauge participants' perceptions of their risk of contracting malaria. Severity was examined through six questions aimed at understanding participants' views on the seriousness and potential health impacts of malaria. General Prevention knowledge was measured with seven questions covering a range of preventive practices and strategies. For all questions, participants responded using a Likert scale with the options Agree, No Idea, and Disagree. This method provided a comprehensive assessment of participants' understanding and perceptions of malaria prevention.

### 2.9.4. Dependent Variable

The primary outcome of the study was the level of knowledge regarding malaria preventive measures, which was classified into two categories: adequate and inadequate knowledge. This classification was based on participants' responses to questions assessing their understanding of malaria prevention strategies and practices.

### 2.9.5. Explanatory Variables

The study examined various sources of information that might influence participants' knowledge of malaria prevention during pregnancy. These explanatory variables were categorized into three distinct types: information received from health posts, where health workers provide direct educational

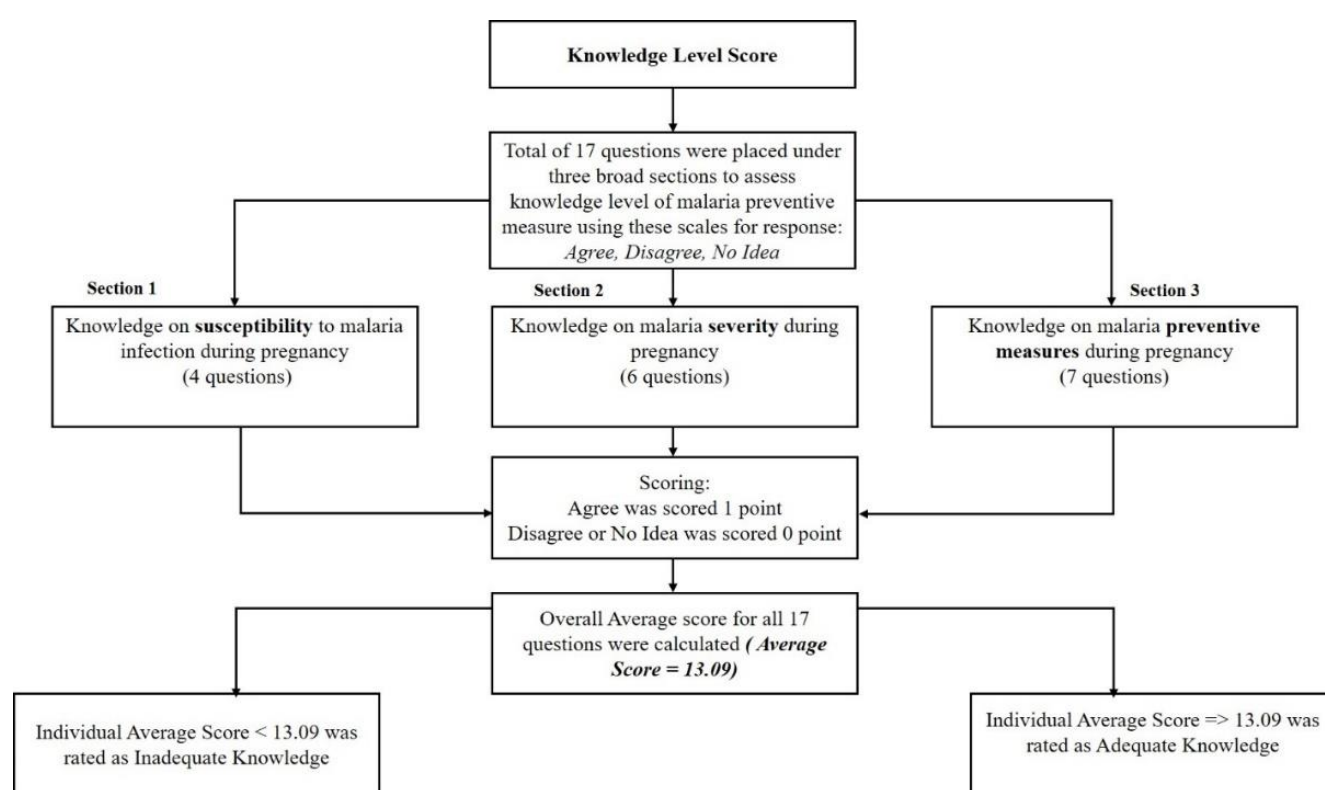


input; information obtained from family members or friends, reflecting informal and interpersonal communication channels; and information sourced from media and written materials, including television, radio, billboard signs, pamphlets, brochures, fact sheets, and leaflets. Analyzing these variables helped determine the impact of different information sources on participants' knowledge levels.

## 2.10. Data Analysis

The data analysis involved several statistical techniques to comprehensively examine the study variables. Descriptive statistics were utilized to summarize the demographic characteristics of participants and the various sources of information they used. To assess the levels of malaria preventive

knowledge, proportions were calculated, providing a clear picture of how many participants had adequate versus inadequate knowledge. The knowledge level scores were computed based on algorithms illustrated in [Figure 1](#). Associations between sources of information and levels of malaria knowledge were analyzed using chi-square tests and logistic regression models, both considered significant at a p-value of 0.05. The chi-square tests assessed the statistical significance of relationships, while logistic regression estimated crude and adjusted odds ratios with 95% confidence intervals to evaluate the impact of information sources on malaria prevention knowledge. All statistical analyses were conducted using IBM SPSS Statistics version 20, ensuring robust and reliable results in evaluating the impact of informational sources on malaria preventive knowledge.



**Figure 1.** Algorithms for Scoring Knowledge of Malaria Preventive Measures.

## 3. Results

### 3.1. Demographic and Health Characteristics of the Study Population

The study included participants predominantly aged 20-35 years (75.0%), with 12.0% under 20 years and 13.0% over 35 years. Self-employment was the primary occupation (49.0%), followed by unemployment (36.7%) and salaried employment (14.3%). Cohabiting women accounted for 43.0%, married women for 30.7%, and single women for 25.3%, while a

smaller percentage were separated or widowed (1.0%). In terms of education, 44.0% completed secondary or vocational education, 34.0% had basic education, 15.7% had tertiary education, and 6.3% reported non-formal education. Christianity was the predominant religion (86.7%), with Islam comprising 13.3% of participants. Gestational periods were distributed with 58.0% in the first trimester (less than 16 weeks) and 42.0% in the second trimester or beyond (16 weeks or more) ([Table 1](#)).

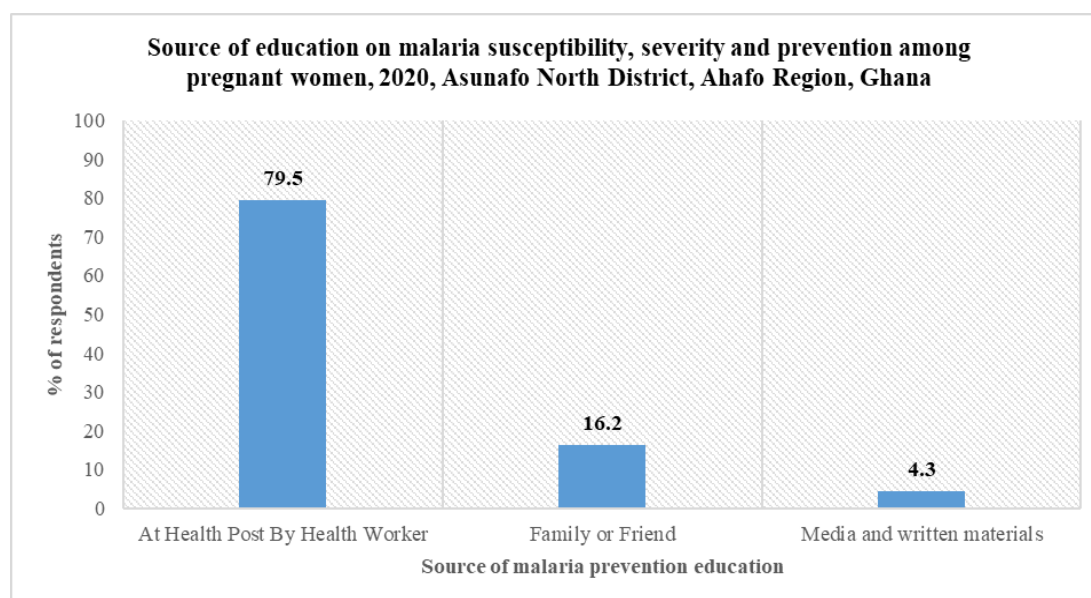
**Table 1.** Demographic and Health Characteristics of the Study Population.

Variables	Frequency	Percent
Age group		
< 20yrs	36	12.0
20 - 35yrs	225	75.0
> 35yrs	39	13.0
Occupation		
Salaried Worker	43	14.3
Self-employed	147	49.0
Unemployed	110	36.7
Marital Status		
Cohabiting	129	43.0
Married	92	30.7
Separated/widowed	3	1.0
Single	76	25.3
Educational Level		
Basic	102	34.0
Non-formal	19	6.3
Secondary/Vocational	132	44.0
Tertiary	47	15.7

Variables	Frequency	Percent
Religion		
Christianity	260	86.7
Islam	40	13.3
Total number of SP received		
2 or less doses	169	56.3
3 or more doses	131	43.7
Gestational age		
< 16 weeks	174	58.0
16 weeks or more	126	42.0

### 3.2. Sources of Information on Malaria Prevention Among Respondents

In the study, the majority of respondents, 79.5%, acquired information about malaria preventive measures from health posts through health workers, totaling 294 individuals. A smaller proportion, 16.2%, received information from family members or friends, comprising 60 individuals. Media and written materials were accessed by 4.3% of respondents, totaling 16 individuals. These findings highlight health posts as the primary source of information on malaria prevention, with family and friends and media playing lesser roles in information dissemination (Figure 2).

**Figure 2.** Sources of Information on Malaria Prevention Among Respondents.

### 3.3. Association Between Source of Information and Knowledge Levels on Malaria Prevention During Pregnancy

The chi-square analyses assessed the relationship between different sources of information on malaria prevention and the level of knowledge among pregnant women. The results indicated a significant association between information received at Health Posts by health workers and knowledge levels, with  $\chi^2 (1, N = 300) = 18.65, p < 0.001$ . Similarly,

information from Family or Friends was significantly associated with knowledge levels, yielding  $\chi^2 (1, N = 300) = 13.94, p < 0.001$ . In contrast, information from media sources and written materials did not show a significant association with knowledge levels, as evidenced by  $\chi^2 (1, N = 300) = 0.44, p = 0.51$ . Overall, the majority of participants demonstrated adequate knowledge of malaria prevention, with 266 out of 300 individuals (88.7%) achieving this level (Table 2). (See Supplementary 1 and 2 for questions and score on knowledge).

**Table 2.** Association Between Source of Information and Knowledge Levels on Malaria Prevention During Pregnancy.

Variables	Knowledge Level n = 300 (%)		X2	P-value
	Inadequate knowledge	Adequate knowledge		
Source of information on malaria prevention during pregnant				
At Health Post By Health Worker	30(8.1)	264(71.4)	18.65	p<0.001**
Family or Friend	15(4.1)	45(12.2)	13.94	p<0.001**
T. V., radio, billboard signs, pamphlets, brochures, fact sheets, leaflets	1(0.3)	15(4.1)	0.44	0.51
Knowledge Level Score	34(11.3)	266(88.7)		

\*\*statistically significant at p-value <0.001, X2 = Chi-Square value, n= number of observations, % = percentage of observation

The logistic regression analysis revealed significant findings regarding the impact of different sources of education on malaria knowledge among pregnant women. Education received at health posts by trained workers was significantly

associated with higher malaria knowledge (AOR = 7.82, 95% CI [1.26, 48.35],  $p = 0.027$ ). Conversely, education from family or friends correlated with lower knowledge levels (AOR = 0.34, 95% CI [0.15, 0.76],  $p = 0.008$ ) (Table 3).

**Table 3.** Logistic Regression Analysis of Adequate Knowledge on Malaria Prevention Among Pregnancy by Source of Education.

Variables	Response (n = 300)	Adequate Knowledge			
		Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Source of information on malaria prevention during pregnant	No	1		1	
	Yes	17.6(3.09 - 100.16)	0.001*	7.82(1.26 - 48.35)	0.027*
	No	1		1	
Family Member or Friend	Yes	0.26(0.12 - 0.55)	P<0.001**	0.34(0.15 - 0.76)	0.008*

\*statistically significant at <0.05, \*\*statistically significant at p-value <0.001, CI = Confident Interval, OR= Odds Ratio

## 4. Discussion

Malaria remains a critical threat to maternal and fetal health

in endemic areas, necessitating effective preventive strategies during pregnancy. This discussion integrated recent findings on the knowledge levels of pregnant women concerning malaria prevention, emphasizing the roles of various educational sources and their implications for public health interventions.

The study revealed that 88.7% of pregnant women had adequate knowledge about malaria prevention, while 11.3% exhibited inadequate knowledge. These findings highlight both the successes and limitations of current educational strategies. This finding collaborates with other studies in Ghana [15], Southwestern Uganda [10], and Northwestern Ethiopia [9] but higher compared to another study conducted in Ethiopia [16] and elsewhere in Uganda [17]. The high percentage of adequate knowledge suggests that existing educational efforts are making a positive impact. However, the significant proportion with inadequate knowledge indicates that there is still a need to refine and enhance these strategies to reach all pregnant women effectively.

Pregnant women who received education from health workers are approximately 7.82 times more likely to have adequate knowledge of malaria compared to those who did not. This underscores the significant impact of structured, facility-based education on enhancing malaria knowledge [18]. The study confirms that education at health posts by trained health workers is strongly associated with higher knowledge levels about malaria prevention among pregnant women [19]. This result demonstrates the effectiveness of structured education programs. Health workers provide accurate and tailored information, improving both comprehension and application of malaria prevention practices [20, 21]. Recent research supports these findings. [22, 23] reported similar positive outcomes in rural Malawi and in the Tano North District, Ghana, where health worker-led programs significantly enhanced maternal health knowledge. Their research highlights the effectiveness of structured, facility-based education in addressing health knowledge gaps, reinforcing the value of formal educational interventions in health facilities.

The effectiveness of health post education can be attributed to several factors. Health workers are trained to deliver evidence-based information and can clarify doubts immediately. Facility-based education provides a controlled environment for systematic and reinforced learning. The success of health post education suggests that investing in training and resources for health workers can lead to substantial improvements in health knowledge and outcomes [12]. Expanding these programs, particularly in underserved areas, could further enhance malaria prevention efforts. However, gaps in coverage and accessibility, especially in remote regions, may limit the effectiveness of these programs. Addressing these gaps could involve deploying mobile health units, increasing the number of trained health workers, and incorporating digital health tools to supplement in-person education.

In this current study, education from family members or friends was associated with lower knowledge levels regarding malaria prevention, highlighting the limitations inherent in informal educational sources. While informal networks such as family and friends play a role in disseminating health information, the quality and accuracy of this information can be inconsistent. This variability can undermine the effectiveness

of malaria prevention efforts. The study's findings are consistent with recent research [18, 24], which also identified limitations in informal education sources. Their study further elaborated, that information about malaria prevention from family and friends often lacked reliability, as these sources may not be well-informed or may disseminate outdated or incorrect information. The informal nature of such education can lead to gaps and inconsistencies in the information provided. These studies underscore that while informal networks are influential in health information dissemination, they frequently fall short of providing the structured and accurate information needed for effective malaria prevention. The implications of relying on informal educational sources are significant. Inadequate or inaccurate information from family and friends can lead to misconceptions or insufficient knowledge about malaria prevention. This gap can negatively impact health outcomes, as pregnant women may not receive the comprehensive guidance required to effectively protect themselves and their unborn children from malaria.

To address the limitations of informal information sources, it is crucial to integrate formal educational interventions. Enhancing malaria prevention education can be achieved through several strategies. First, combining informal networks with formal education can boost effectiveness; for example, community health workers could partner with family members to reinforce key messages and correct misinformation. Second, training and supporting informal educators, such as family and friends, can improve their understanding of malaria prevention and the accuracy of the information they share. Third, targeted educational campaigns that address common misconceptions and provide clear, actionable advice can counteract the risks of misinformation, using diverse media and communication channels to reach various audiences. Lastly, regular monitoring and evaluation of educational interventions are essential to identify areas for improvement, ensuring that strategies remain effective and relevant. Feedback from the target population can be instrumental in refining and adapting educational content and methods. In conclusion, while informal education from family and friends can play a role in health information dissemination, its limitations necessitate the integration of formal educational programs. Addressing the gaps identified in informal education and implementing strategies to improve the accuracy and effectiveness of health messages are crucial for enhancing malaria prevention efforts and achieving better health outcomes for pregnant women.

The current study found that education delivered through media and written materials did not significantly enhance malaria knowledge among pregnant women. This finding does not conform to another study conducted in Ghana [25], Nigeria [26] and in sub-Saharan Africa [27]. Although these channels have broad reach, they often fail to address the specific needs of this demographic. In the study setting, malaria education is typically broadcast on radio stations at times when many people, including pregnant women, are either



preparing to leave home or returning from daily activities. This timing reduces the impact of these programs. Additionally, malaria prevention flyers and banners are often displayed only at health facilities, limiting access for those who do not visit these locations. Consequently, most pregnant women interviewed did not consider mass media a regular source of malaria prevention information. One reason for the limited impact of media and written materials could be their general nature, which does not always align with the particular needs and contexts of pregnant women. These sources often do not provide the detailed, actionable information required to address specific concerns related to malaria prevention during pregnancy. Consequently, the effectiveness of these educational tools may be diminished when they do not resonate with the target audience's immediate and practical needs. This suggests that while media and written materials offer accessibility, their lack of specificity can limit their effectiveness in enhancing knowledge acquisition.

To address these gaps, strategies should focus on several key strategies. First, developing targeted media content that specifically addresses the unique concerns and situations of pregnant women can improve the relevance and effectiveness of the information [28]. This approach should include creating specialized campaigns that concentrate on aspects of malaria prevention that are particularly relevant to pregnant women. Additionally, campaigns on radio and other media outlets should use the CHAP concept to identify optimal times when pregnant women are most likely to engage with the content. This strategy will enhance the planning of media education efforts, thereby increasing their impact on malaria prevention among pregnant women in the study setting. Second, ensuring that written materials are both accessible and tailored to the needs of this group is crucial. Materials should be designed to be user-friendly, engaging, and directly relevant to the challenges faced by pregnant women. Finally, ongoing research should evaluate the effectiveness of these targeted approaches to ensure that educational content remains impactful and responsive to the needs of pregnant women. By implementing these strategies, the potential of media and written materials to improve knowledge levels among pregnant women can be significantly enhanced.

## 5. Conclusions

This study highlights the importance of effective educational strategies in malaria prevention for pregnant women. Although most participants demonstrated adequate knowledge, a significant proportion still had gaps, indicating the need for improved educational efforts. Structured education from health workers at health posts was highly effective, reinforcing previous findings on the value of facility-based interventions. However, media and written materials had limited impact, largely due to their general nature and timing issues.

Informal education from family and friends was also less effective possible due to inconsistent and unreliable infor-

mation. To address these issues, future efforts should focus on creating targeted media content, optimizing educational timing, and ensuring that written materials are accessible and relevant. Regular evaluation of these strategies is essential to enhance their effectiveness and better meet the needs of pregnant women, ultimately improving malaria prevention outcomes.

## 6. Strengths and Limitations of This Study

The study benefits from a broad sample of pregnant women, providing a comprehensive view of malaria prevention knowledge across diverse sources. It offers valuable insights into the effectiveness of various educational sources, such as health posts, family, friends, and media. The findings align with recent research, reinforcing their validity and relevance. Additionally, the study identifies key gaps in knowledge, particularly related to informal and media-based education, which is essential for developing targeted interventions.

The cross-sectional design restricts causal inference and generalizability to other urban settings in Ghana. Furthermore, the lack of existing literature on sources of information about malaria prevention among pregnant women limits the understanding of educational interventions' impact. Future research should adopt longitudinal methods to assess long-term effects on knowledge retention and behavioural change and explore the roles of socioeconomic factors and prior health education experiences in shaping malaria prevention knowledge.

## 7. Recommendations

To effectively combat malaria and enhance public health outcomes, targeted educational strategies are essential. These strategies should empower communities, particularly pregnant women, with accurate information and resources. The following recommendations aim to strengthen health education initiatives and ensure consistent messaging across both formal and informal networks:

*Enhance Health Post Education:* The District Health Department should expand and strengthen health post education programs by increasing the number of trained health workers and enhancing their training. Investing in mobile health units, coordinated by the Community Health Services Division, can further extend educational outreach to remote areas, improving malaria prevention knowledge among pregnant women.

*Integrate Informal and Formal Education:* The Education and Health Promotion Unit should integrate informal educational sources, such as vibrant individuals within the community, with formal health education. Community health workers, supported by the Local Health Promotion Team,

can collaborate with informal networks to reinforce accurate malaria prevention messages and correct misinformation, ensuring consistent information dissemination.

**Develop Targeted Campaigns:** The Communication and Public Health Campaigns Unit should design and implement educational campaigns tailored to the specific needs of pregnant women. These campaigns should address common misconceptions and provide clear, actionable advice on malaria prevention, utilizing diverse media and communication channels for effective outreach.

**Monitor and Evaluate:** The District Monitoring and Evaluation Office should establish regular assessments of both informal and formal educational interventions. Utilizing feedback from pregnant women and health workers, the Evaluation Unit can refine strategies to ensure that educational efforts remain effective and relevant.

## 8. Ethical Considerations

Ethical approval was obtained from the Ethical clearance was secured from the Ghana Health Service Ethics Review Committee. Informed consent was obtained from all participants before their inclusion in the study, ensuring voluntary participation and confidentiality of responses.

## Abbreviations

CHAP	Community Health Action Plan
FM	Frequency Modulation
SP	Sulfadoxine-Pyrimethamine
TV	Television

## Supplementary Material

The supplementary material can be accessed at <https://doi.org/10.11648/j.wjph.20240904.12>

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## Data Availability Statement

The data is available from the corresponding author upon reasonable request.

## Conflicts of Interest

The authors declare no conflicts of interest.

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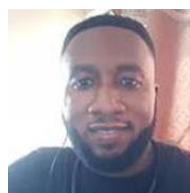
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**Richmond Bediako Nsiah** (Corresponding Author), is a prominent member of the Public Health Department at the Asokore Mampong Municipal Health Directorate. He holds a Master of Public Health in Health Information and has over a decade of experience managing malaria intervention projects. His recent work as a consultant for JSI on the USAID MRITE and Global Vax projects has further enhanced his expertise, complemented by professional certificates in Monitoring and Evaluation, Project Management, and Leadership and Management from the University of Washington. In his current role, he mentors healthcare professionals in effective health planning, oversees health information systems and data management related to malaria interventions, and leads capacity-building initiatives aimed at improving skills in malaria prevention, diagnosis, and treatment. Additionally, Richmond actively engages in community outreach to raise awareness about malaria prevention and control measures, guiding a group of young health practitioners dedicated to enhancing health service delivery through research and community engagement strategies.

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