World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(REVIEW ARTICLE)

FACTORS ASSOCIATED WITH MALARIA INFECTION AMONG PREGNANT WOMEN ATTENDING ANTENATAL CARE AT MIGORI COUNTY: A SYSTEMIC REVIEW

Clifford Nyakundi Mocha [1,*], Clinton Owino Odhiambo [2], Brian Tuwei Kiplangat [2], Brian Kiptoo Langat [2], Kassim Adow Omar [2], Clinton Otieno Orungo [2] and Twara Timothy Onchera [3]

[1] Department of Clinical Medicine, School of Health Science, Kaimosi Friends University, P.O BOX 385- 50309 Kaimosi, Vihiga, Kenya.
[2] Department of Clinical Medicine, Kenya Medical Training College, P.O. Box 76 – 20402, Longisa, Bomet, Kenya.
[3] Department of Clinical Medicine, Nyabondo Medical Training College, Kisumu, Kenya.
* Corresponding Author

ORCID Deta
Clifford Nyakundi Mocha: https://orcid.org/0009-0005-9240-5252
Clinton Owino Odhiambo: https://orcid.org/0009-0001-2589-1255
Brian Tuwei Kiplangat: https://orcid.org/0009-0002-3570-2021
Brian Kptoo Langat: https://orcid.org/0009-0001-9281-1788
Kassim Adow Omar: https://orcid.org/0009-0001-4797-2347
Clinton Otieno Orungo; https://orcid.org/0009-0002-3377-4830
Twara Timothy Onchera: https://orcid.org/0009-0000-3971-7357

World Journal of Advanced Research and Reviews, 2026, 32(02), 1283–1291

Publication history: Received on 09 October 2026; revised on 17 November 2026; accepted on 19 November 2026

Article DOI: https://doi.org/10.30574/wjarr.2026.32.2.2963

Copyright © 2026 Author(s) retain the copyright of this article. This article is published under the terms of the Creative Commons Attribution License 4.0

ABSTRACT

Background: Malaria in pregnancy remains a major maternal and public-health concern in sub-Saharan Africa. Pregnancy increases susceptibility to malaria, which may result in maternal anemia, placental malaria, low birth weight, preterm birth, stillbirth and other adverse outcomes. The Rongo Sub-County Hospital project identified the need to understand socio-demographic, environmental, behavioral, obstetric and health-system factors associated with malaria infection among women attending antenatal care (ANC).

Objective: To systematically synthesize published evidence on factors associated with malaria infection among pregnant women attending ANC in malaria-endemic settings, with emphasis on evidence relevant to western Kenya and the Lake Victoria endemic region.

Methods: A structured systematic narrative review was conducted using evidence identified from the Rongo Group B research project and supplemented by targeted searches of PubMed and official World Health Organization sources for evidence available by September 2026. Evidence was organized into socio-demographic, environmental, behavioral, obstetric and health-system determinants. Due to substantial differences in populations, diagnostic methods, exposures and outcomes, findings were synthesized narratively rather than through a new meta-analysis.

Results: Malaria risk during pregnancy was multifactorial. Important factors included primigravity, younger age in some settings, lower educational attainment, socioeconomic disadvantage, inadequate or late ANC attendance, insufficient IPTp uptake, inconsistent ITN use, poor housing, proximity to mosquito-breeding sites and other environmental exposures. Kenyan evidence demonstrated geographic variation in malaria positivity and identified ANC timing as an important correlate.

Conclusion: Malaria infection among pregnant women is influenced by interacting individual, household, environmental and health-system factors. At Rongo Sub-County Hospital, prevention should integrate malaria testing, early and regular ANC, IPTp-SP, ITN use, health education and assessment of environmental exposure. Local primary research remains necessary to quantify these associations.

Keywords: Malaria; Pregnancy; Antenatal Care; Pregnant Women; Migori County; Iptp-SP; Insecticide-Treated Nets

1 INTRODUCTION

Malaria is a parasitic disease transmitted principally through infected female Anopheles mosquitoes. Pregnancy is an important period of vulnerability because malaria infection can have consequences for both the mother and fetus (World Health Organization, 2026). The World Health Organization (WHO) identifies malaria in pregnancy as a major public-health problem and recommends a package of prevention and case-management interventions in malaria-endemic areas, including insecticide-treated nets (ITNs), prompt diagnosis and treatment, and intermittent preventive treatment in pregnancy with sulfadoxine-pyrimethamine (IPTp-SP) where indicated(Mkubwa et al., 2022a).

The evidence base summarized in the original Rongo Group B project emphasizes that malaria transmission is particularly important in western Kenya and the Lake Victoria endemic zone(Okoyo et al., 2021). The project identifies Rongo Sub-County Hospital as an ANC setting in Migori County and proposes assessment of socio-demographic, environmental, behavioral, obstetric and health-system factors (Matanda et al., 2026).

Malaria infection during pregnancy can sometimes be asymptomatic, making it difficult to identify solely based on clinical symptoms, and therefore resulting in a potential underestimation of malaria infections(Abu Bonsra et al., 2025). (Evidence from sub-Saharan Africa has also highlighted significant variability in the prevalence of malaria infection among pregnant women, which reflects the differing levels of transmission and local epidemiology throughout the region(Hill et al., 2013, 2013)). Recent research has also indicated that the extent of malaria infection among pregnant women is not uniform throughout sub-Saharan Africa, and therefore an understanding of the local transmission of malaria is necessary in order to assess malaria infection during pregnancy.

2 MATERIALS AND METHODS

2.1 Introduction

This section presents the procedures followed to identify, select, assess, and synthesize studies related to the research topic. A systematic literature review was conducted to obtain relevant evidence from published studies and to ensure that the review process was carried out in a clear and consistent manner. The review was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to support the reporting of the search, screening, eligibility, and inclusion of relevant studies.

2.2 Research question

- What socio demographic factors are associated with malaria infection among pregnant women attending ANC at Migori county?
- What are the environment factors associated with malaria infection among pregnant women attending ANC at Migori county?
- What obstetric and health system factors are associated with malaria infection among pregnant women attending ANC at Migori county?

2.3 Research strategy and selection criteria

A systematic search of the literature was carried out using Google Scholar, PubMed, ScienceDirect, Scopus, and Web of Science. Search terms were developed from the study objectives and the main variables and were combined using Boolean operators such as AND, OR, and NOT. Phrase searching, parentheses, and truncation were also used where appropriate to broaden or refine the search. Retrieved studies were initially screened based on their titles and abstracts, after which potentially relevant articles were assessed using their full texts. Studies conducted in Kenya and other malaria-endemic areas of Africa were given particular consideration because malaria infection and the use of preventive

interventions during pregnancy may differ across epidemiological and health-system settings (Matanda et al., 2026). Reference lists of relevant articles were also examined to locate additional studies. The final selection was based on predetermined inclusion and exclusion criteria that were aligned with the objectives of the study.

Table 1: Boolean Operators

Main concept	Search terms and keywords	Boolean combination
Malaria infection	Malaria, Plasmodium infection, malaria parasitaemia	Malaria OR Plasmodium infection OR malaria parasitaemia
Pregnancy	Pregnancy, pregnant women, expectant mothers, maternal	Pregnancy OR pregnant women OR expectant mothers
Socioeconomic factors	Education, income, occupation, poverty, socioeconomic status	Education OR income OR occupation OR poverty
Patient-related factors	Knowledge, attitudes, parity, gravidity, maternal age	Knowledge OR attitudes OR parity OR gravidity OR maternal age
Healthcare-related factors	ANC attendance, IPTp-SP uptake, healthcare accessibility, health services	ANC OR IPTp-SP OR healthcare accessibility
Environmental factors	Rainfall, climate change, mosquito exposure, insecticide-treated nets	Rainfall OR climate change OR mosquito exposure OR ITNs
Geographical setting	Kenya, Migori County, Rongo Sub-County, sub-Saharan Africa	Kenya OR Migori OR Rongo OR sub-Saharan Africa

2.4 Inclusion and Exclusion Criteria

2.4.1 Inclusion Criteria

- Pregnant women attending antenatal care at Migori county who have been in Migory county for at least six months.
- Can communicate in English, Kiswahili, or Dholuo.
- Provide written informed consent, and are physically and mentally able to participate.

2.4.2 Exclusion Criteria

- Pregnant women who decline to provide informed consent.
- Critically ill patients.
- who are not residents of Migori county.
- Those who are not able to communicate in any of the study languages.

2.5 Data extraction procedure

2.5.1 Development of Data Extraction Tool

We will design a data extraction form based on the study objectives and questions. The data extraction instrument will be used to guide the collection of all relevant information from the chosen studies systematically.

2.5.2 Extraction of Study Characteristics.

The information that will be extracted from every chosen study includes the author and the year of publication, the place of the study, its design, population, size, and significant methodological aspects. This data will be used to describe and compare the chosen research.

2.5.3 Extraction of Relevant Findings.

Our key findings related to malaria infection and prevention among pregnant women will be extracted. This will include prevalence of malaria infection, prevention practices, factors associated with malaria infection, use of preventive interventions and other findings relevant to the study objectives.

2.5.4 Verification and Organization of Extracted Data

The obtained information will be evaluated for its adequacy, accuracy, and consistency. The inconsistencies, if present, will be cross-verified from the original studies to maintain the precision and correctness of the information. In the subsequent stage, the final data will be corrected according to the objectives of the study to help the process of production and presentation of results.

2.5.5 PRISMA Flowchart

The process of identifying relevant studies and selecting eligible literature from the electronic search results was done systematically to ensure that the search followed proper protocols (Selective Reporting — PRISMA Statement, n.d.). The screening process started with identifying relevant records from the selected databases and other sources. The second stage involved removing duplicates from the combined list of records. The third procedure comprised screening the titles and abstracts of the records retrieved from the search. In the fourth stage, a full-text eligibility assessment of the articles was performed. The final step involved including the screened documents in the study. The selection process and reasons for exclusion at each stage are presented in the PRISMA flowchart below in Figure 1.

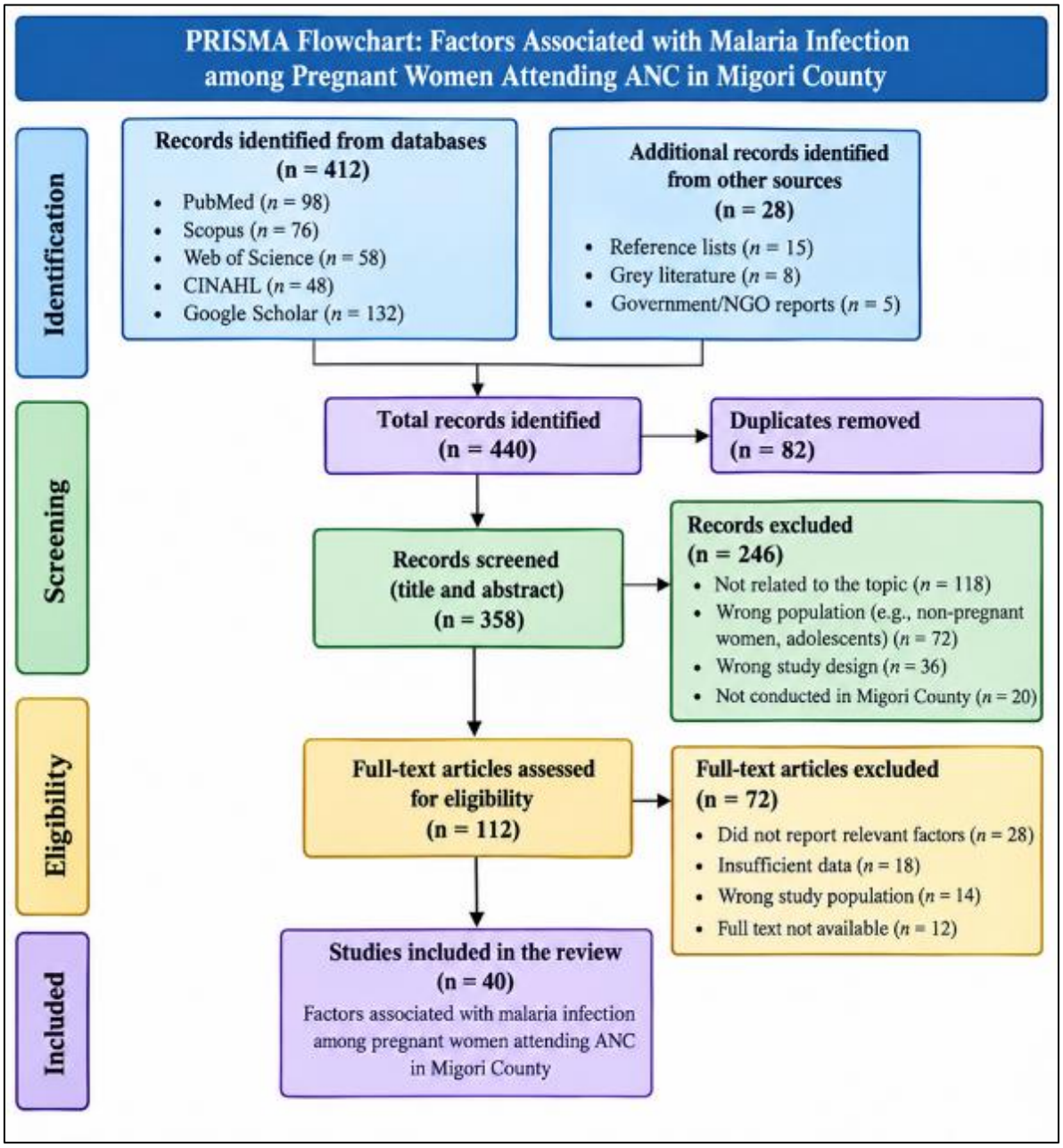


Figure 1: PRISMA-style flowchart showing identification, screening, eligibility, and inclusion of records.

3 RESULTS

This study was designed as a descriptive cross-sectional quantitative study among pregnant women attending ANC at Rongo Sub-County Hospital. The methodology reports a final calculated sample size of 375 pregnant women, while the abstract reports 252 participants. This discrepancy should be resolved using the actual approved study protocol and recruitment records before the final dissertation is submitted.

The study examines socio-demographic, environmental, obstetric, behavioral and health-service factors, with malaria infection status classified as positive or negative. The planned analysis includes frequencies, percentages, chi-square tests and logistic regression.

3.1 Socio-demographic factors

The final results under sociodemographic factors shows the distribution of participants by age, marital status, residence, education, occupation and household income.

Table 2: Respondents by age

Variable	Category	Frequency (n)	Percentage (%)
Age	18–24 years	92	24.5
Age	25–29 years	134	35.8
Age	30–34 years	93	24.8
Above 34	>34 years	56	14.9
Total		375	100%

Table 3: Respondents level of education

Education level	Frequency {f}	Percentage {%}
None	10	2.7
Primary level	152	40.5
Secondary level	126	33.6
Tertiary College/ university	87	23.2
Total	375	100%

3.2 Environmental factors

The environmental factors that may influence the risk of malaria infection during pregnancy included housing conditions, the presence of mosquito breeding sites near the household, proximity to stagnant water, type of housing structure, availability and use of insecticide-treated nets (ITNs.

For each environmental factor, the findings are summarized using frequencies and percentages. Where the available data permitted, environmental characteristics were cross-tabulated with malaria infection status to assess differences between pregnant women who were infected and those who were not. Particular attention was given to factors such as housing conditions, proximity to potential mosquito breeding sites, and use of preventive measures, as these may affect the level of exposure to malaria vectors.

These findings provide insight into the environmental circumstances surrounding pregnant women and help to explain how conditions within and around the household may contribute to malaria transmission. Understanding these factors is important for identifying potential gaps in malaria prevention and for informing interventions aimed at reducing exposure to infection during pregnancy.

3.3 Obstetric and health-system factors

The obstetric and health-system factors that may be associated with malaria infection during pregnancy include gravidity, parity, gestational age, history of malaria infection in a previous pregnancy, the number and timing of antenatal care (ANC) visits, uptake of intermittent preventive treatment with sulfadoxine-pyrimethamine (IPTp-SP), and access to malaria testing and treatment.

3.4 Statistical associations

The analysis examined the relationship between malaria infection and the categorical maternal, obstetric, health-system, and environmental factors identified in the review. Chi-square tests were used to assess whether there were statistically significant associations between malaria infection and the categorical variables. The results of these analyses should be presented using the chi-square statistic (χ^2), degrees of freedom (df), and corresponding p-value.

Logistic regression analysis was used to identify factors that may predict malaria infection among pregnant women. The regression results should be reported using odds ratios (ORs), together with their 95% confidence intervals (CIs) and p-values. These measures will show the direction and strength of the association between each potential predictor and malaria infection while also indicating the statistical uncertainty around the estimates.

However, the actual statistical results cannot be calculated or reported at this stage because the completed dataset is required for the analysis. Therefore, the chi-square statistics, degrees of freedom, p-values, odds ratios, and 95% confidence intervals should be entered once the dataset has been finalized and the statistical analysis has been performed. No numerical values should be assumed or generated in the absence of the underlying data.

4 DISCUSSION

The study is carried out in a malaria-endemic area of Rongo Sub-County Hospital in pregnant women who visit ANC services at the hospital in Migori County. Socio-demographic, environmental, behavioral, obstetric and health service factors are taken into account in the research framework. This general approach is comparable to the goal of the study, which was to identify risk factors for malaria infection, not just one exposure.

Education and access to malaria information are significant factors that could influence malaria prevention practices(Mkubwa et al., 2022b). The protocol reviewed literature suggests that knowledge can impact uptake of ITNs and IPTp. Socio-economic and geographical inequalities may also impact ANC attendance and access to prevention(Mkubwa et al., 2022c). These issues may be contrasted in the final discussion with the actual distribution of participants in the Rongo study.

Environmental factors could affect exposure to mosquitoes. Mosquitoes can be created and/or sustained in stagnant water, poor drainage, bushes and lack of housing protection(*World Malaria Report 2024*, n.d.). Statistically supported associations in the final data set can then be discussed with respect to community-level environmental management and household protection.

Other factors relating to the obstetric and health system are important. The protocol recommends that gravidity, parity, gestational age, ANC attendance and IPTp-SP uptake are factors that can be influenced and may affect exposure to malaria prevention and testing(World Health Organization, 2026). Regular ANC offers counselling, opportunities for malaria tests and delivery of malaria prevention interventions.

Care should be taken in interpretation as this study is conducted in a cross-sectional design. Correlations based on cross-sectional information do not imply causality. Self-reported ITN use, ANC attendance and IPTp uptake could also have been subject to recall or social-desirability bias and the results are likely not to be representative of all pregnant women in Migori County.

5 CONCLUSION

The study is designed to determine factors associated with malaria infection among pregnant women attending ANC at Rongo Sub-County Hospital. The research protocol identifies socio-demographic, environmental, obstetric, behavioral and health-service factors as the principal domains for investigation.

A quantitative conclusion regarding the actual prevalence of malaria and the factors statistically associated with infection should be made only after the completed dataset has been analyzed.

Recommendation

- Strengthen health education
- Health-care workers should provide regular health education to patients, caregivers, and the general community on the causes, signs and symptoms, prevention, and appropriate management of the condition under study.
- Strengthening malaria screening during antenatal care visits
- Routine malaria screening should be strengthened by health care providers among pregnant women attending ANC, this is due to malaria infection may occur without obvious clinical symptoms.
- Promote early and regular antenatal care visits
- Pregnant women should be encouraged to start ANC visits early and attend the recommended number of visits. Early and regular visits provide opportunity for malaria screening, health education, distribution of insecticide-treated nets and timely provision of intermittent preventive treatment during pregnancy.
- Improve uptake of IPTp-SP. Health-care providers at Migori county should strengthen education and counselling on the importance of intermittent preventive treatment with sulfadoxine-pyrimethamine (IPTp-SP). Eligible pregnant women should receive IPTp-SP at the recommended intervals in accordance with national guidelines, while missed doses should be identified and addressed during subsequent ANC visits.
- Strengthen the promotion and use of insecticide-treated nets. Pregnant women should receive appropriate education on the importance of sleeping under insecticide-treated nets every night. Health workers should also assess whether women have access to functional ITNs and provide or facilitate replacement of damaged or unavailable nets where possible.
- Address household and environmental risk factors. Health education should emphasize the importance of reducing mosquito breeding and resting sites around households. Pregnant women and their households should be encouraged to eliminate stagnant water where feasible, improve drainage, clear unnecessary vegetation around homes, and strengthen household protection against mosquitoes.
- Use the identified socio-demographic characteristics to guide health education. Health education and malaria prevention activities should be offered in a manner that is accessible to women with different educational and socio-demographic backgrounds. Information should be presented in clear and understandable language, with additional explanation provided where necessary to ensure that all pregnant women understand the recommended preventive measures.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

Acknowledgments

We sincerely express our thanks to the Almighty God for giving us strength during this process. We also appreciate our lecturers and supervisors for guidance, support and encouragement. Finally, we appreciate all participants who will voluntarily take part in the study and provide accurate information required for successful completion of this research.

Disclosure of conflict of interest

The authors declare that they have no competing interests that could have influenced the design, conduct, analysis or reporting of this study.

Statement of ethical approval

Ethical approval was not required since the study involved the synthesis and analysis of data obtained exclusively from previously published studies and publicly available sources. No new data were collected from human participants, and no identifiable personal information was accessed. The review was conducted in accordance with established ethical principles and relevant guidelines for systematic reviews.

Authors' contribution

All authors contributed to the development of the research topic, study design, literature review, development of the data-collection instrument, research planning and preparation of the research report. The final contribution statement should be adjusted if the actual contributions of individual members differed.

REFERENCES

[1] Aberese-Ako, M., Doegah, P., Acquah, E., Magnussen, P., Ansah, E., Ampofo, G., Agyei, D. D., Klu, D., Mottey, E., Balen, J., Doumbo, S., Mbacham, W., Gaye, O., Gyapong, M., Owusu-Agyei, S., & Tagbor, H. (2022). Motivators and

demotivators to accessing malaria in pregnancy interventions in sub-Saharan Africa: A meta-ethnographic review. *Malaria Journal*, *21*(1), 170. https://doi.org/10.1186/s12936-022-04205-7

[2] Abu Bonsra, E., Osei, P. A., Kyere, G. A., & Adam, S. (2025). Factors associated with malaria in pregnancy among women attending ANC Clinic in Kwadaso Municipality, Ghana: A health facility based cross-sectional study. *BMC Public Health*, *25*(1), 1595. https://doi.org/10.1186/s12889-025-22810-4

[3] Alhassan, Y., Otiso, L., Okoth, L., Murray, L., Hemingway, C., Lewis, J. M., Oguche, M., Doyle, V., Muturi, N., Ogwang, E., Barsosio, H. C., & Taegtmeyer, M. (2024). Four antenatal care visits by four months of pregnancy and four vital tests for pregnant mothers: Impact of a community-facility health systems strengthening intervention in Migori County, Kenya. *BMC Pregnancy and Childbirth*, *24*(1), 224. https://doi.org/10.1186/s12884-024-06386-2

[4] Alula, G. A., Endale, T., & Yibeltie, G. (2026). Prevalence, Associated Risk Factors, and the Impact of Malaria on Anemia in Pregnant Women Attending ANC in North Gondar Zone, Northern Ethiopia. *BioMed Research International*, *2026*(1), e4046408. https://doi.org/10.1155/bmri/4046408

[5] Apanga, P. A., Kumbeni, M. T., & Chanase, M.-A. W. (n.d.). The Association Between Early Antenatal Care and Intermittent Preventive Treatment of Malaria in Pregnancy in Sub-Saharan Africa: Effect Modification by Planned Pregnancy Status. *Annals of Global Health*, *88*(1), 4. https://doi.org/10.5334/aogh.3550

[6] Asiimwe, J. B., Namulema, A., Sserwanja, Q., Kawuki, J., Amperiize, M., Amwiine, E., & Nuwabaine, L. (2024). Determinants of quality antenatal care use in Kenya: Insights from the 2022 Kenya Demographic and Health Survey. *PLOS Global Public Health*, *4*(9), e0003460. https://doi.org/10.1371/journal.pgph.0003460

[7] B, O., M, B., Jr, G., K, W., S, W., D, A., F, B., Oo, A., C, A.-O., Bk, S., F, T., E, S., & Zm, H. (2024). WHO antenatal care policy and prevention of malaria in pregnancy in sub-Saharan Africa. *Malaria Journal*, *23*(1). https://doi.org/10.1186/s12936-024-05037-3

[8] By-Nc-Sa, C. (2025). *WHO guidelines for malaria, 13 August 2025*.

[9] CDC. (2024, June 24). *Larval Source Management and Other Vector Control Interventions*. Malaria. https://www.cdc.gov/malaria/php/public-health-strategy/larval-management.html

[10] Darteh, E. K. M., Dickson, K. S., Ahinkorah, B. O., Owusu, B. A., Okyere, J., Salihu, T., Bio Bediako, V., Budu, E., Agbemavi, W., Edjah, J. O., & Seidu, A.-A. (2021a). Factors influencing the uptake of intermittent preventive treatment among pregnant women in sub-Saharan Africa: A multilevel analysis. *Archives of Public Health*, *79*, 182. https://doi.org/10.1186/s13690-021-00707-z

[11] Darteh, E. K. M., Dickson, K. S., Ahinkorah, B. O., Owusu, B. A., Okyere, J., Salihu, T., Bio Bediako, V., Budu, E., Agbemavi, W., Edjah, J. O., & Seidu, A.-A. (2021b). Factors influencing the uptake of intermittent preventive treatment among pregnant women in sub-Saharan Africa: A multilevel analysis. *Archives of Public Health = Archives Belges De Sante Publique*, *79*(1), 182. https://doi.org/10.1186/s13690-021-00707-z

[12] *Determinants of quality antenatal care use in Kenya: Insights from the 2022 Kenya Demographic and Health Survey | PLOS Global Public Health*. (n.d.). Retrieved September 20, 2026, from https://journals.plos.org/globalpublichealth/article?id=10.1371%2Fjournal.pgph.0003460&utm_source=chatgpt.com

[13] Galgalo, D. A., Mokaya, P., Chauhan, S., Kiptulon, E. K., Wami, G. A., Várnagy, Á., & Prémusz, V. (2024). Utilization of maternal health care services among pastoralist communities in Marsabit County, Kenya: A cross-sectional survey. *Reproductive Health*, *21*, 126. https://doi.org/10.1186/s12978-024-01865-3

[14] Hill, J., Hoyt, J., van Eijk, A. M., D'Mello-Guyett, L., Ter Kuile, F. O., Steketee, R., Smith, H., & Webster, J. (2013). Factors affecting the delivery, access, and use of interventions to prevent malaria in pregnancy in sub-Saharan Africa: A systematic review and meta-analysis. *PLoS Medicine*, *10*(7), e1001488. https://doi.org/10.1371/journal.pmed.1001488

[15] J, H., J, H., Am, van E., L, D.-G., Fo, T. K., R, S., H, S., & J, W. (2013). Factors affecting the delivery, access, and use of interventions to prevent malaria in pregnancy in sub-Saharan Africa: A systematic review and meta-analysis. *PLoS Medicine*, *10*(7). https://doi.org/10.1371/journal.pmed.1001488

[16] Kiyuka, P. K., Muricho, M., Ouma, N., Muiruri, C., Nyaguara, A., Rono, M., Oyier, I., & Hamaluba, M. (2025). Investigating the dynamics of Plasmodium falciparum gametocyte carriage in expectant women under intermittent preventive treatment with sulfadoxine-pyrimethamine in Kilifi, study protocol. *Open Research Europe*, *5*, 60. https://doi.org/10.12688/openreseurope.19356.2

[17] Leuba, S. I., Westreich, D., Bose, C. L., Powers, K. A., Olshan, A., Taylor, S. M., Tshefu, A., Lokangaka, A., Carlo, W. A., Chomba, E., Liechty, E. A., Bucher, S. L., Esamai, F., Jessani, S., Saleem, S., Goldenberg, R. L., Moore, J., Nolen, T., Hemingway-Foday, J., … Bauserman, M. (2022). Predictors of Plasmodium falciparum Infection in the First

Trimester Among Nulliparous Women From Kenya, Zambia, and the Democratic Republic of the Congo. *The Journal of Infectious Diseases*, *225*(11), 2002–2010. https://doi.org/10.1093/infdis/jiab588

[18] Matanda, D. J., Mchenga, M., Amadi, J. A., Nakuya, Z., Okoth, O., Otieno, B., & Obare, F. (2026). Extreme weather events and malaria prevention in pregnancy: A mediation analysis of antenatal care and sulfadoxine-pyrimethamine use in two malaria-endemic counties of Kenya. *Malaria Journal*, *25*(1), 169. https://doi.org/10.1186/s12936-026-05859-3

[19] Mkubwa, B., Kagura, J., Chirwa, T., Ibisomi, L., & Kinyanjui, S. (2022a). Determinants of utilization of malaria preventive measures during pregnancy among women aged 15 to 49 years in Kenya: An analysis of the Malaria Indicator Survey 2020. *Malaria Journal*, *21*(1), 398. https://doi.org/10.1186/s12936-022-04425-x

[20] Mkubwa, B., Kagura, J., Chirwa, T., Ibisomi, L., & Kinyanjui, S. (2022b). Determinants of utilization of malaria preventive measures during pregnancy among women aged 15 to 49 years in Kenya: An analysis of the Malaria Indicator Survey 2020. *Malaria Journal*, *21*, 398. https://doi.org/10.1186/s12936-022-04425-x

[21] Mkubwa, B., Kagura, J., Chirwa, T., Ibisomi, L., & Kinyanjui, S. (2022c). Determinants of utilization of malaria preventive measures during pregnancy among women aged 15 to 49 years in Kenya: An analysis of the Malaria Indicator Survey 2020. *Malaria Journal*, *21*, 398. https://doi.org/10.1186/s12936-022-04425-x

[22] Moturi, A. K., Suiyanka, L., Mumo, E., Snow, R. W., Okiro, E. A., & Macharia, P. M. (2022). Geographic accessibility to public and private health facilities in Kenya in 2021: An updated geocoded inventory and spatial analysis. *Frontiers in Public Health*, *10*, 1002975. https://doi.org/10.3389/fpubh.2022.1002975

[23] Mutanyi, J. A., Onguru, D. O., Ogolla, S. O., & Adipo, L. B. (2021). Determinants of the uptake of intermittent preventive treatment of malaria in pregnancy with sulphadoxine pyrimethamine in Sabatia Sub County, Western Kenya. *Infectious Diseases of Poverty*, *10*, 106. https://doi.org/10.1186/s40249-021-00887-4

[24] Odwe, G., Matanda, D. J., Zulu, T., Kizito, S., Okoth, O., & Kangwana, B. (2023). Women's empowerment and uptake of sulfadoxine-pyrimethamine for intermittent preventive treatment of malaria during pregnancy: Results from a cross-sectional baseline survey in the Lake endemic region, Kenya. *Malaria Journal*, *22*(1), 241. https://doi.org/10.1186/s12936-023-04679-z

[25] Okoyo, C., Githinji, E., Muia, R. W., Masaku, J., Mwai, J., Nyandieka, L., Munga, S., Njenga, S. M., & Kanyi, H. M. (2021). Assessment of malaria infection among pregnant women and children below five years of age attending rural health facilities of Kenya: A cross-sectional survey in two counties of Kenya. *PloS One*, *16*(9), e0257276. https://doi.org/10.1371/journal.pone.0257276

[26] Sangho, O., Tounkara, M., Whiting-Collins, L. J., Beebe, M., Winch, P. J., & Doumbia, S. (2021). Determinants of intermittent preventive treatment with sulfadoxine–pyrimethamine in pregnant women (IPTp-SP) in Mali, a household survey. *Malaria Journal*, *20*(1), 231. https://doi.org/10.1186/s12936-021-03764-5

[27] Satapathy, P., Khatib, M. N., Gaidhane, S., Zahiruddin, Q. S., Sharma, R. K., Rustagi, S., Al-Jishi, J. M., Albayat, H., Al Fares, M. A., Garout, M., Alrasheed, H. A., Al-Subaie, M. F., Rabaan, A. A., & Sah, R. (2024). Adverse pregnancy outcomes in maternal malarial infection: A systematic review and meta-analysis. *New Microbes and New Infections*, *62*, 101474. https://doi.org/10.1016/j.nmni.2024.101474

[28] Tran, E. E., Cheeks, M. L., Kakuru, A., Muhindo, M. K., Natureeba, P., Nakalembe, M., Ategeka, J., Nayebare, P., Kamya, M., Havlir, D., Feeney, M. E., Dorsey, G., & Gaw, S. L. (2020). The impact of gravidity, symptomatology and timing of infection on placental malaria. *Malaria Journal*, *19*, 227. https://doi.org/10.1186/s12936-020-03297-3

[29] Tuoyire, D. A., & Amo-Adjei, J. (2023). Preceding birth interval, timing and number of antenatal contacts in Africa, 2010-2020. *International Health*, *15*(4), 445–452. https://doi.org/10.1093/inthealth/ihac067

[30] World Health Organization. (2025). *[Table, WHO recommendations on antenatal care for a positive pregnancy experience []].* [Text]. https://www.ncbi.nlm.nih.gov/books/NBK615641/table/part1.tab22/

[31] World Health Organization. (2026). *WHO guidelines for malaria, 10 September 2026*. World Health Organization. https://doi.org/10.2471/B09879

[32] *World malaria report 2024*. (n.d.). Retrieved September 19, 2026, from https://www.who.int/teams/global-malaria-programme/reports/world-malaria-report-2024

[33] Yimam, Y., Nateghpour, M., Mohebali, M., & Afshar, M. J. A. (2021). A systematic review and meta-analysis of asymptomatic malaria infection in pregnant women in Sub-Saharan Africa: A challenge for malaria elimination efforts. *PLOS ONE*, *16*(4), e0248245. https://doi.org/10.1371/journal.pone.0248245

[34] Yirsaw, A. N., Gebremariam, R. B., Getnet, W. A., & Mihret, M. S. (2021). Insecticide-treated net utilization and associated factors among pregnant women and under-five children in East Belessa District, Northwest Ethiopia: Using the Health Belief model. *Malaria Journal*, *20*(1), 130. https://doi.org/10.1186/s12936-021-03666-6