https://rijournals.com/biological-and-applied-science/

RESEARCH INVENTION JOURNAL OF BIOLOGICAL AND APPLIED SCIENCES 4(2):56-59, 2024

©RIJBAS Publications ISSN: 1597-2879

https://doi.org/10.59298/RIJBAS/2024/425659

# Assessing the Impact of Intermittent Preventive Treatment in Reducing Malaria Incidence among Pregnant Women in High-Risk Areas

**Natukwasa Loyce**

**Department of Clinical Medicine and Dentistry Kampala International University Uganda**
**Email: Loyce.natukwasa@studwc.kiu.ac.ug**

## ABSTRACT

Malaria poses significant health risks for pregnant women, especially in high-transmission areas such as sub-Saharan Africa. Physiological and immunological changes during pregnancy increase vulnerability to malaria-related complications, including maternal anemia, low birth weight, and preterm delivery, which can severely impact maternal and neonatal health. To combat these risks, the World Health Organization (WHO) recommended Intermittent Preventive Treatment in Pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP) as a proactive measure to reduce malaria incidence in this population. IPTp-SP, administered at regular intervals starting from the second trimester, has shown promising outcomes, such as reduced malaria prevalence, improved maternal hemoglobin levels, and lower incidence of placental malaria. This narrative review synthesized current literature on IPTp's effectiveness, challenges, and future directions, analyzing studies across multiple high-risk regions to highlight both successes and barriers in IPTp implementation. Key challenges identified include rising SP resistance, limited healthcare infrastructure, and socio-cultural obstacles impacting adherence. To address these, alternative strategies such as introducing alternative antimalarial drugs like dihydroartemisinin-piperaquine (DP), expanding antenatal care (ANC) services, and utilizing community health workers (CHWs) to improve IPTp delivery are examined. Emerging mobile health (mHealth) tools are also explored as potential solutions for enhancing adherence. Recommendations for policy included investment in ANC infrastructure, community-based outreach, and increased support for research on SP alternatives. The findings underscored IPTp's essential role in protecting maternal and child health, while highlighting areas for innovation and policy reform to optimize its impact in malaria-endemic regions.

**Keywords:** Intermittent Preventive Treatment (IPTp), Malaria, Pregnant Women, Sulfadoxine-Pyrimethamine (SP), Public Health.

## INTRODUCTION

Malaria remains a leading public health challenge, particularly in sub-Saharan Africa, where pregnant women face heightened susceptibility to infection and its severe consequences [1–3]. Due to physiological and immunological changes during pregnancy, women in high-malaria-transmission areas are at an increased risk of malaria-related complications, which can lead to maternal anemia, low birth weight, premature delivery, and in severe cases, maternal and neonatal mortality [4]. To address these risks, the World Health Organization (WHO) has recommended Intermittent Preventive Treatment in Pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP) as a preventive measure against malaria in pregnancy. IPTp-SP involves administering antimalarial drugs at scheduled intervals starting in the second trimester, regardless of the presence of symptoms, to prevent Plasmodium falciparum infection and reduce associated adverse health outcomes.

IPTp-SP has shown considerable effectiveness in clinical studies, leading to decreased incidence rates of malaria, improved maternal hemoglobin levels, and a reduction in cases of placental malaria [5]. These benefits highlight the potential of IPTp to improve maternal and fetal health in regions with high malaria prevalence. However, despite these advantages, IPTp implementation faces numerous obstacles, including increasing SP resistance, logistical barriers in drug delivery, and socio-cultural factors affecting adherence among pregnant women.

Additionally, the effectiveness of IPTp varies significantly across regions, necessitating a nuanced understanding of its impact in diverse high-risk settings.

This review assesses the current impact of IPTp in reducing malaria incidence among pregnant women in high-risk areas, analyzing the effectiveness, limitations, and future potential of this intervention. By examining both the successes and challenges of IPTp implementation, this analysis aims to provide insights that could inform more effective strategies for malaria prevention in pregnancy, ultimately contributing to improved maternal and neonatal health outcomes in vulnerable populations.

## THE MECHANISM AND ROLE OF IPTP IN MALARIA PREVENTION

IPTp functions as a preventive therapeutic strategy that administers antimalarial drugs to pregnant women, regardless of their infection status, to preemptively suppress the parasite [6]. This approach contrasts with traditional treatment methods aimed solely at symptomatic cases. SP, the most commonly used drug for IPTp, is administered at specified intervals starting in the second trimester and continuing throughout pregnancy. The protective effect of SP is achieved by disrupting the Plasmodium falciparum lifecycle and preventing the parasite from reaching levels that would result in clinical malaria. This, in turn, decreases the likelihood of malaria-related complications such as maternal anemia and adverse birth outcomes. The WHO recommends at least three doses of IPTp-SP for pregnant women in malaria-endemic regions. Studies suggest that adherence to the recommended IPTp regimen significantly reduces the risk of maternal and fetal morbidity associated with malaria. Specifically, IPTp-SP has been associated with a reduction in placental malaria, which occurs when malaria-infected red blood cells accumulate in the placenta, obstructing nutrient and oxygen flow to the fetus. Placental malaria is particularly detrimental, contributing to low birth weight and preterm delivery, both of which are critical determinants of neonatal survival and development.

## CURRENT EVIDENCE ON IPTP EFFECTIVENESS

Recent studies underscore the efficacy of IPTp in reducing malaria incidence among pregnant women in high-risk regions, with multiple trials demonstrating substantial declines in malaria prevalence and associated complications [7, 8]. For example, a study conducted in sub-Saharan Africa showed that women who received IPTp-SP experienced above 40% reduction in malaria prevalence compared to those who did not receive the preventive treatment [9, 10]. Additionally, IPTp-SP has been linked to improved maternal hemoglobin levels, a critical factor in preventing malaria-induced anemia in pregnancy. Improved hemoglobin levels, in turn, decrease the risk of maternal morbidity and mortality, underscoring the multifaceted benefits of IPTp in enhancing maternal health. However, the efficacy of IPTp-SP varies across regions, with evidence indicating that its impact is influenced by factors such as malaria transmission intensity, adherence rates, and local resistance patterns. In areas with high malaria transmission, multiple studies have reported that adherence to a three-dose IPTp regimen results in significant reductions in both maternal malaria incidence and placental malaria prevalence. Conversely, in regions with rising resistance to SP, the efficacy of IPTp-SP appears diminished, prompting calls for alternative medications or combination therapies that can offer similar protective effects.

## CHALLENGES IN IMPLEMENTING IPTP IN HIGH-RISK AREAS

Implementing IPTp in high-risk areas poses several challenges, including logistical, social, and biological barriers [11, 12]. One of the primary obstacles is the increasing resistance to SP among Plasmodium falciparum strains in many high-risk areas. As resistance reduces the drug's efficacy, it threatens to undermine the protective benefits of IPTp-SP and highlights the need for alternative antimalarial drugs that can maintain effectiveness. Research into potential alternatives such as dihydroartemisinin-piperaquine (DP) and mefloquine has shown promise, but these alternatives also come with concerns, including higher costs and potential side effects.

Health infrastructure limitations also impede the effective delivery of IPTp. In many high-risk regions, especially rural areas with limited healthcare access, pregnant women often lack the necessary access to antenatal care (ANC) services, which are essential for administering IPTp. Inadequate health facilities, supply chain disruptions, and shortages of trained healthcare personnel further exacerbate these challenges, reducing the reach and consistency of IPTp-SP delivery. Improving ANC coverage and strengthening supply chains are thus critical steps in enhancing IPTp implementation in high-risk settings.

Socio-cultural barriers also play a role in IPTp uptake. Studies have documented misconceptions and concerns among pregnant women regarding the safety and efficacy of IPTp-SP, leading to low adherence rates in certain communities. Some women fear potential side effects or perceive SP as ineffective, often due to inadequate health education or previous adverse experiences with malaria treatments. Addressing these socio-cultural factors through community-based awareness campaigns and targeted educational programs is essential to improve acceptance and adherence to IPTp.

## ALTERNATIVE STRATEGIES AND FUTURE DIRECTIONS

Given the challenges associated with SP resistance, alternative strategies for IPTp are under active investigation[13, 14]. One promising alternative is IPTp with DP, which has shown comparable efficacy to SP in clinical trials and is less affected by the existing resistance patterns. In several high-burden malaria settings, IPTp-DP has demonstrated a higher efficacy in reducing malaria incidence and associated complications among

pregnant women. However, DP's higher cost and need for multiple doses present logistical challenges that may limit its adoption in low-resource settings. Another strategy involves enhancing the role of community health workers (CHWs) in IPTp delivery. CHWs can play a pivotal role in increasing IPTp coverage by bringing preventive services directly to women who may not otherwise have access to ANC. Community-based IPTp delivery has shown promising results in several African countries, with studies indicating that CHW involvement significantly increases IPTp uptake. By leveraging CHWs, high-risk regions can expand IPTp access, improve adherence rates, and foster community trust in malaria prevention strategies [15]. Additionally, integrating IPTp with other maternal health interventions, such as iron supplementation and nutritional counseling, could further improve health outcomes for pregnant women. This integrated approach addresses multiple determinants of maternal health, providing a more holistic intervention that not only reduces malaria incidence but also enhances overall maternal well-being. Emerging mobile health (mHealth) solutions also offer potential for improving IPTp adherence and coverage. Mobile applications and SMS reminders can support pregnant women in adhering to their IPTp schedule, especially in remote areas where direct healthcare access may be limited.

## POLICY IMPLICATIONS AND RECOMMENDATIONS

To maximize the impact of IPTp in reducing malaria incidence among pregnant women, policymakers must prioritize interventions that address both biological and infrastructural challenges [16, 17]. First, it is essential to support research efforts aimed at developing alternative IPTp drugs, especially in regions where SP resistance is high. Government investment in drug research and development can accelerate the introduction of new, more effective antimalarial therapies that are both affordable and accessible for high-risk populations. Enhancing ANC services is equally important, particularly in rural and underserved areas where IPTp access remains limited. Expanding ANC infrastructure, training healthcare personnel, and ensuring consistent drug supply chains are critical components for improving IPTp delivery. Furthermore, integrating community-based approaches into national IPTp programs could improve outreach and foster greater adherence in populations with limited healthcare access. Governments should consider policies that incentivize CHWs to participate in IPTp delivery, as well as support community education initiatives aimed at dispelling myths and increasing awareness about the benefits of IPTp. Public health campaigns and mHealth initiatives could further support IPTp adherence. Mobile-based reminder systems and educational messages can encourage pregnant women to complete their IPTp doses, while broader health campaigns can raise community awareness about malaria prevention. Collaborations with international organizations and NGOs can also bolster funding and resource availability, helping to bridge gaps in healthcare access in high-risk regions.

## CONCLUSION

Intermittent Preventive Treatment in Pregnancy (IPTp) with sulfadoxine-pyrimethamine (SP) has emerged as a critical intervention for reducing malaria incidence among pregnant women in high-risk areas. Evidence shows that IPTp not only decreases malaria prevalence but also improves maternal hemoglobin levels, reduces placental malaria, and lowers risks associated with low birth weight and preterm delivery. These health improvements underscore IPTp's role in enhancing maternal and fetal outcomes, particularly in regions with high malaria transmission. However, despite these advantages, challenges such as SP resistance, limited healthcare infrastructure, and socio-cultural barriers impede the widespread effectiveness and adoption of IPTp. Addressing these challenges will require a multifaceted approach, including the exploration of alternative antimalarial drugs, such as dihydroartemisinin-piperaquine (DP), and enhanced community health initiatives. Expanding access to antenatal care (ANC) services, increasing public health education, and integrating community health workers into IPTp delivery programs could further improve adherence and reduce logistical barriers in high-risk regions. Additionally, mobile health (mHealth) solutions may offer innovative ways to support IPTp adherence, particularly in remote areas. In conclusion, IPTp remains a valuable tool in reducing malaria incidence and improving health outcomes for pregnant women and their newborns. Strengthening implementation strategies, developing alternative therapies, and fostering community engagement will be essential to maximizing IPTp's impact. A collaborative, comprehensive approach will be key to overcoming existing obstacles and ensuring that IPTp reaches its full potential in safeguarding maternal and child health in malaria-endemic regions.

## REFERENCES

1. Egwu, C., Chinyere, A., Chukwu, J., Alum, E., Tsamesidis, I., Aja, P., Offor, C., Obasi, N.: A world free of malaria: It is time for Africa to actively champion and take leadership of elimination and eradication strategies. African Health Sciences. 22, 627–640 (2022). https://doi.org/10.4314/ahs.v22i4.68
2. Erisa, K., Raphael, I., P.C., U., Alum, E.: Exploration of Medicinal Plants Used in the Management of Malaria in Uganda. (2023)
3. Alum, E., Ugwu, P.-C., Simeon, E., Uti, D., Alum, B., Extension, K.P.: Climate Variability and Malaria Transmission: Unraveling the Complex Relationship. INOSR Scientific Research. 11, 16–22 (2024). https://doi.org/10.59298/INOSRSR/2024/1.1.21622

4. Unger, H.W., Ashorn, P., Cates, J.E., Dewey, K.G., Rogerson, S.J.: Undernutrition and malaria in pregnancy – a dangerous dyad? BMC Med. 14, 142 (2016). https://doi.org/10.1186/s12916-016-0695-2
5. Nana, R.R.D., Hawadak, J., Foko, L.P.K., Kumar, A., Chaudhry, S., Arya, A., Singh, V.: Intermittent preventive treatment with Sulfadoxine pyrimethamine for malaria: a global overview and challenges affecting optimal drug uptake in pregnant women. Pathogens and Global Health. 117, 462–475 (2023). https://doi.org/10.1080/20477724.2022.2128563
6. Moehrle, J.J.: Development of New Strategies for Malaria Chemoprophylaxis: From Monoclonal Antibodies to Long-Acting Injectable Drugs. Tropical Medicine and Infectious Disease. 7, 58 (2022). https://doi.org/10.3390/tropicalmed7040058
7. David, B., University IX, K.I.: Maternal-Infant Transmission of Malaria. 5, 11–15 (2024)
8. Rubenstein, B.L., Chinkhumba, J., Chilima, E., Kwizombe, C., Malpass, A., Cash, S., Wright, K., Troell, P., Nsona, H., Kachale, F., Ali, D., Kaunda, E., Lankhulani, S., Kayange, M., Mathanga, D.P., Munthali, J., Gutman, J.R.: A cluster randomized trial of delivery of intermittent preventive treatment of malaria in pregnancy at the community level in Malawi. Malar J. 21, 195 (2022). https://doi.org/10.1186/s12936-022-04216-4
9. Koita, K., Bognini, J.D., Agboraw, E., Dembélé, M., Yabré, S., Bihoun, B., Coulibaly, O., Niangaly, H., N'Takpé, J.-B., Lesosky, M., Scaramuzzi, D., Worrall, E., Hill, J., Briand, V., Tinto, H., Kayentao, K.: Increasing the uptake of Intermittent Preventive Treatment of malaria in pregnancy using Sulfadoxine-Pyrimethamine (IPTp-SP) through seasonal malaria chemoprevention channel delivery: protocol of a multicenter cluster randomized implementation trial in Mali and Burkina Faso. BMC Public Health. 24, 43 (2024). https://doi.org/10.1186/s12889-023-17529-z
10. Azizi, S.C., Chongwe, G., Chipukuma, H., Jacobs, C., Zgambo, J., Michelo, C.: Uptake of intermittent preventive treatment for malaria during pregnancy with Sulphadoxine-Pyrimethamine (IPTp-SP) among postpartum women in Zomba District, Malawi: a cross-sectional study. BMC Pregnancy Childbirth. 18, 108 (2018). https://doi.org/10.1186/s12884-018-1744-y
11. Nishan, M.D.N.H., Akter, K.: Coverage and determinants of Intermittent Preventive Treatment in pregnancy (IPTp) in Cameroon, Guinea, Mali, and Nigeria. PLOS ONE. 19, e0313087 (2024). https://doi.org/10.1371/journal.pone.0313087
12. Loechl, C.U., Datta-Mitra, A., Fenlason, L., Green, R., Hackl, L., Itzkowitz, L., Koso-Thomas, M., Moorthy, D., Owino, V.O., Pachón, H., Stoffel, N., Zimmerman, M.B., Raiten, D.J.: Approaches to Address the Anemia Challenge. The Journal of Nutrition. 153, S42–S59 (2023). https://doi.org/10.1016/j.tjnut.2023.07.017
13. Anchang-Kimbi, J.K., Kalaji, L.N., Mbacham, H.F., Wepnje, G.B., Apinjoh, T.O., Ngole Sumbele, I.U., Dionne-Odom, J., Tita, A.T.N., Achidi, E.A.: Coverage and effectiveness of intermittent preventive treatment in pregnancy with sulfadoxine–pyrimethamine (IPTp-SP) on adverse pregnancy outcomes in the Mount Cameroon area, South West Cameroon. Malar J. 19, 100 (2020). https://doi.org/10.1186/s12936-020-03155-2
14. Hoyt, J., Hill, J., Achieng, F., Ouma, P., Kariuki, S., Desai, M., Webster, J.: Healthcare provider and pregnant women's perspectives on the implementation of intermittent screening and treatment with dihydroartemisinin–piperaquine for malaria in pregnancy in western Kenya: a qualitative study. Malar J. 20, 291 (2021). https://doi.org/10.1186/s12936-021-03826-8
15. Egwu, C.O., Aloke, C., Chukwu, J., Nwankwo, J.C., Irem, C., Nwagu, K.E., Nwite, F., Agwu, A.O., Alum, E., Offor, C.E., Obasi, N.A.: Assessment of the Antimalarial Treatment Failure in Ebonyi State, Southeast Nigeria. Journal of Xenobiotics. 13, 16–26 (2023). https://doi.org/10.3390/jox13010003
16. Ansah, E.K., Moucheraud, C., Arogundade, L., Rangel, G.W.: Rethinking integrated service delivery for malaria. PLOS Global Public Health. 2, e0000462 (2022). https://doi.org/10.1371/journal.pgph.0000462
17. Gill, J., Anvikar, A.R.: New Strides in Prevention of Malaria during Pregnancy Present Multitudinous Opportunities. ACS Infect. Dis. 10, 3721–3735 (2024). https://doi.org/10.1021/acsinfecdis.4c00566


**CITE AS: Kansiime Agnes. (2024). Assessing the Impact of Intermittent Preventive Treatment in Reducing Malaria Incidence among Pregnant Women in High-Risk Areas. RESEARCH INVENTION JOURNAL OF BIOLOGICAL AND APPLIED SCIENCES 4(2):56-59.** https://doi.org/10.59298/RIJBAS/2024/425659