



A pregnant woman in Papua New Guinea. Photo by UNFPA/Patrick Rose

GEDSI CASE STUDY

Addressing malaria in pregnancy as a key strategy for social inclusion in Asia Pacific

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Executive Summary

Malaria in pregnancy (MiP) has wide-ranging negative impacts on maternal, newborn and child health. However, the issue has historically been overlooked as an important public health concern and is often under-prioritised in health policy and programmes. This case study examines the burden of MiP in the Asia Pacific region and explores how some countries are innovating and adapting their malaria strategies to address the issue. Innovations and modifications include: testing and comparing the efficacy and programmatic feasibility of different screening approaches for the early detection of MiP; adapting vector control strategies to accommodate pregnant women and girls as a high-risk group for malaria; and testing different drug combinations and delivery mechanisms for the intermittent preventive treatment of malaria in pregnancy (IPTp). The case study highlights ongoing gaps and challenges that need to be addressed in order to reduce the burden of MiP in the region and opportunities to strengthen the programmatic focus on MiP in socially-inclusive ways. The case study advocates for countries within the region and international development partners to give higher priority to MiP, including MiP-focused research, as an important but neglected public health concern.



Introduction

Malaria in pregnancy (MiP) is under-researched and inconsistently prioritised in health policy and programmes, despite its wide-ranging impacts on maternal, newborn and child health (1,2). Pregnant women are categorised as a high-risk group for malaria by the World Health Organization (WHO), although at the national level, malaria resources are often channelled to other priorities, including childhood malaria and malaria in non-pregnant populations. The mother-to-child transmission (MTCT) of HIV is also often given higher priority in health budgets, despite the higher prevalence of MiP (3). In parts of the Asia Pacific region, current malaria elimination efforts are prioritising male high-risk groups, such as mobile and migrant populations or forest goers of working age. This is crowding out attention to other inequities in the malaria burden, including those based on gender (4).

The historical omission of pregnant females in clinical research due to ethical concerns relating to harm has resulted in a knowledge gap on safe options to prevent or treat malaria in pregnancy (5,6). Of 500 anti-malarial drug trials implemented over the 40 years prior to 2006, pregnant women and girls were intentionally included in only 6% (5). In recent years, consensus has grown around the need for a robust evidence base to support new preventive, diagnostic and treatment options for pregnant women. This is changing the way that clinical research is being conducted (6,7). It is anticipated that this will reduce the lengthy delays that have beset the introduction of new drug therapies for pregnant women and girls because of safety considerations.

In the Asia Pacific region, a historical lack of data on the size of the MiP burden has weakened the impetus to address the issue. The lack of evidence on the effectiveness of MiP intervention strategies outside Africa, where transmission may be lower and both *Plasmodium falciparum* (*P. falciparum*) and *Plasmodium vivax* (*P. vivax*) are present, is a further challenge (8). In addition, the high prevalence of asymptomatic malaria in pregnant women (88% among parasitised individuals in one meta-analysis of studies conducted in Asia) means that a large part of the malaria in pregnancy burden is missed (9). Despite these challenges, the importance of intensifying efforts to address MiP to secure the success of malaria elimination efforts in the Asia Pacific region is increasingly recognised (10-13).

This case study examines the burden of MiP in the Asia Pacific region and explores how selected national malaria programmes are innovating and adapting their intervention strategies to address the issue. It highlights some ongoing challenges and opportunities to address these in socially inclusive ways. The case study advocates for countries in the region to give higher priority to MiP, including MiP-focused research, as an important but neglected public health concern.

Background

A Significant Public Health Issue

MiP carries many risks for pregnant women and girls, the fetus and newborns in the form of gestational malaria (infection experienced during pregnancy), placental malaria (infection of the placenta, which may or may not be symptomatic) and congenital malaria (the infection of the newborn up to 28 days old) (14). For pregnant women and girls, MiP can lead to maternal anaemia and significantly increase the risk of maternal death before and after delivery (15). Various studies in the Asia Pacific region have linked MiP to an increased risk of maternal death and morbidity (11). Placental malaria can disrupt fetal growth and cause low birth weight, with potential negative impacts on child growth and cognitive outcomes. It may also lead to pre-term birth or stillbirth. If undiagnosed, congenital malaria can be life-threatening for a newborn baby.

In the Southeast Asia region, among pregnancies at risk of malaria in 2020, 0.8% were estimated to be at risk of stillbirth, 34.9% at risk of induced abortion, 13% at risk of miscarriage, and 51.3% of livebirths were estimated to be at risk of malaria. In the Western Pacific region, the risk was 0.5% (stillbirth), 38.2% (induced abortion), 13% (miscarriage) and 48.4% (livebirths at risk of malaria) (16).

The highest risk of experiencing adverse pregnancy outcomes associated with malaria occurs in women who are younger, malnourished, experiencing their first or second pregnancy, have HIV or lack immunity to pregnancy-associated malaria (17).

Burden and Trends

Recent estimates of the size and trends in the MiP burden have helped to fill a gap in the evidence base. Globally, the number of pregnancies at risk of malaria fell between 2007-2020, by 11.4% in areas with *P. falciparum* transmission, and 42.8% in areas of *P. vivax* transmission. Large reductions occurred in the Asia Pacific region, largely due to the impact of malaria prevention and control efforts, while Africa saw an increase, which has been attributed to population growth (15,16).

The overall reduction in the number of pregnancies at risk of malaria is encouraging. However, in 2020, there were still an estimated 121.9 million pregnancies at risk. Over 40% (52.9 million) of these were in the WHO Southeast Asia region and 4.2% (5.1 million) in the Western Pacific region. Together, these two regions had more pregnancies at risk of malaria than the entire WHO Africa region (Table 1) (16). It is noteworthy, therefore, that the 2024 World Malaria Report does not report on MiP outside Africa (15).

While the MiP burden is region-wide, the most critical challenge is concentrated in Papua New Guinea and the Solomon Islands due to high malaria transmission rates in these countries.

Table 1: Estimated pregnancies at risk of malaria, by region, 2020

Region	Population at risk of malaria (millions)	% of global pregnancies at risk
Global	121.9	-
Southeast Asia	52.9	43.40%
Africa	46.1	37.80%
Eastern Mediterranean	11.1	9.10%
Americas	6.7	5.50%
Western Pacific	5.1	4.20%

Source: Global estimates of the number of pregnancies at risk of malaria from 2007-2020: a demographic study.

Why Malaria in Pregnancy Matters in the Asia Pacific region

An estimated 58 million pregnant women are at risk of malaria in Southeast Asia and the Western Pacific. Yet MiP is insufficiently prioritized in national malaria programmes.

MiP has wide-ranging negative impacts on maternal, newborn and child health. Many of these adverse outcomes could be averted using existing interventions and technologies.

A lack of data on the size and characteristics of the burden at sub-national level, including on how the burden differs based on age, poverty, disability and other stratifiers is an issue in the region.

The recommended interventions for addressing MiP are largely based on experience in sub-Saharan Africa. These need to be modified to suit the Asia Pacific context.

The achievement of malaria elimination depends on ensuring that all groups benefit from available interventions. This includes pregnant women and girls, a vulnerable group that is often overlooked.

Strategies Used to Reach and Include Pregnant Women

Adverse maternal and newborn outcomes from MiP are preventable with the right interventions (17). However, there is a lack of tailored normative guidance on the prevention and treatment of MiP in the Asia Pacific (10). Heterogeneous transmission patterns, different malaria vectors, and growing drug resistance present unique challenges for the region.

The main interventions recommended by the WHO are the distribution of insecticide-treated nets (ITNs), preferably long-lasting insecticide-treated nets (LLINs), to pregnant women and early detection and effective case management of clinical malaria (19). National malaria programmes in the Asia Pacific region therefore have a limited number of evidence-based interventions that they can utilize to address MiP. Nevertheless, in response to the MiP burden, some countries have innovated or modified recommended strategies to suit their specific contexts.

Intermittent Preventive Treatment of Malaria in Pregnancy

The intermittent preventive treatment of malaria in pregnancy with sulfadoxine-pyrimethamine (IPTp-SP) is proven to reduce maternal and neonatal mortality and morbidity (19). The drug is administered at every ANC visit during the second and third trimesters of pregnancy, with a minimum gap of one month between each visit. This is an efficacious intervention in a context where current diagnostic tests (e.g. microscopy and rapid diagnostic tests – RDTs) lack sensitivity to detect placental malaria in a large proportion of women (20,21). However, WHO currently recommends IPTp for pregnant women only in high transmission settings in Africa (19). In the Asia Pacific region, malaria transmission is heterogeneous, with many countries experiencing moderate or low transmission. Widespread resistance to SP in the region has also acted as a barrier to the introduction of IPTp. SP-resistance surveillance is therefore important before programme rollout.

Nonetheless, IPTp-SP was adopted by Papua New Guinea (PNG) in 2009. The country therefore represents an outlier to the WHO-recommended guidelines on MiP. In 2022, PNG implemented a clinical trial of IPTp-SP in a low transmission setting (i.e. Port Moresby). The trial reported notable reductions in adverse pregnancy outcomes, including preterm birth, low birth weight babies, perinatal deaths and maternal anaemia. A key finding was that the non-malarial mechanisms of SP, which is a broad-spectrum antibiotic, likely contributed to the better health outcomes by addressing underlying health conditions such as sexually transmitted infections, which are highly prevalent in PNG. The study concluded that IPTp-SP should be universally accessible to pregnant women in PNG, regardless of the transmission setting (21). The government's current malaria strategy supports the provision of IPTp-SP in all burden reduction settings across the country, specifically locations below 1,600 metres altitude (22). The emerging evidence that IPTp-SP yields health benefits even at very low transmission levels due to non-malaria effects, such as preventing other infections, is important given that IPTp is a relatively low-cost intervention.

PNG is also currently implementing a clinical trial to test whether IPTp-SP plus dihydroartemisinin-piperaquine (DP) reduces the risk of malaria infection and adverse birth outcomes in a malaria endemic area compared to IPTp-SP alone (23). The study, which concludes at the end of 2025, will provide important data to guide PNG's MiP strategy. It will also assist other countries in the Asia Pacific region that are experiencing resistance to SP and a high burden of adverse pregnancy outcomes from malaria and other health conditions.

Early Detection Through Screening

To address the need for early diagnosis of MiP, several countries in the region have introduced screening programmes for pregnant women during antenatal care (ANC) (10). In 2012, Indonesia was the first country in Asia to introduce screening for malaria for all pregnant women during an initial ANC visit. Although an improvement on the previous strategy of passive case detection, the single screening and treatment (SSTp) strategy has several limitations. The reliance on passive case detection in later stages of pregnancy results in asymptomatic cases being missed. Health workers have also been concerned about the accuracy of rapid diagnostic tests for malaria (RDTs), which are used by health facilities when microscopy is not available. Delivery of the strategy has also been challenging. A study implemented from 2015-2016 found that the intervention was inconsistently implemented in Eastern Indonesia, which is highly endemic for malaria (24).

In response to these challenges, Indonesia has continued to evolve its approach to MiP by strengthening the evidence base on what works in different contexts. A clinical trial, implemented from 2013-2016, tested the efficacy of the SSTp strategy compared to intermittent screening and treatment of malaria (ISTp) at every ANC visit and IPTp in Sumba Island and Papua in Eastern Indonesia (25,26). The effect of ISTp on malaria prevalence was inconclusive. However, compared to SSTp, IPTp-DP reduced the prevalence of malaria infection at delivery by 41% and the incidence of clinical malaria in pregnancy by 78% (26). The results were found in both *P. falciparum* and *P. vivax* infections, which suggests that IPTp-DP effectively delayed relapses in women and girls diagnosed with *P. vivax*, but who could not be treated with primaquine because this is contraindicated during pregnancy. These positive effects were seen in Papua, an area of moderate malaria transmission, but not in Sumba, where there was lower malaria transmission. The research study concluded that IPTp-DP could offer an efficacious alternative to the current SSTp policy in higher transmission settings.

A subsequent trial implemented from 2022 to 2023 tested the delivery and clinical effectiveness of IPTp-DP in a real-world setting in Papua. Piloted through routine ANC services, the intervention involved a multi-day regimen of three tablets of DP per day for three days. The first dose was administered in a health facility, and subsequent doses were administered at home, monitored by facility-based health providers or community health workers (CHWs). The study found that user adherence to DP was high at over 90%. Compared to SSTp, IPTp-DP reduced adverse maternal outcomes. A full course of IPTp-DP led to a significant reduction in maternal malaria and moderate anaemia. There was also an effect on neonatal outcomes, although this was less significant (27). The study led to a change in government policy. IPTp-DP is currently being offered to pregnant women in Indonesia in all locations with an Annual Parasite Index (API) of > 100/1,000.

Other countries, including Malaysia, Bangladesh, Cambodia, and Pakistan, have also introduced early screening for malaria during pregnancy. However, the evidence base underpinning these interventions is weak (10). The Ministry of Public Health in Thailand introduced weekly screening of pregnant women in temporary shelters on the Thai-Myanmar border. This led to a significant reduction in maternal mortality from *P. falciparum* malaria among pregnant women (28). The screening programme was highly intensive and benefitted from a largely static and therefore easy-to-reach target group of clients. Although very effective, weekly screening will likely not be replicable or affordable to deliver through routine ANC services (25). Nevertheless, there are important lessons from Thailand's experience for other countries in the Asia Pacific region. For instance, India currently relies on passive case detection during ANC to control malaria (29). There may be scope to introduce a mechanism for proactive screening for MiP, especially in high-risk areas.

Adaptation of Vector Control Strategies

Several countries in the Asia Pacific region have adjusted their LLIN strategies to accommodate pregnant women as a high-risk group for malaria. Some countries have adopted universal provision of LLINs to women during their first ANC visit (e.g. Vanuatu). Other countries target LLINs to pregnant women only in higher endemicity areas. For example, the current policy within PNG is to distribute LLINs to pregnant women on a continuous basis in areas with an API of 100/1,000 or higher. Bangladesh, India, Nepal and Pakistan similarly restrict LLIN distribution to pregnant women based on endemicity (10). However, these modifications of LLIN distribution strategies to accommodate MiP commonly lack a robust evidence base, highlighting the need for further context-specific research in the region.

New Drug Treatments

There are limited drug options for treating uncomplicated malaria within the first trimester of pregnancy. For many years, quinine or quinine with clindamycin were the only options recommended by WHO. These drugs have low efficacy compared to Artemisinin-based Combination Therapy (ACT), leaving pregnant women exposed to malaria infection. Poor adherence due to the complicated treatment regimen, poor tolerance and lack of availability are further challenges with the non-ACT drugs (30). In 2022, based on the results of several clinical trials that assessed the efficacy and safety of alternative ACTs (31), WHO changed its guidance to recommend the use of artemether–lumefantrine (AL) for the treatment of malaria in the first trimester of pregnancy. This drug is associated with a lower risk of adverse pregnancy outcomes compared to oral quinine. Inadequate safety data are available to support the use of other ACTs during the first trimester. Hence, further research is needed, including in countries in the Asia Pacific region (10).

Research is also underway to identify an effective and safe form of malaria chemoprevention for pregnant women and girls with HIV. Although WHO recommends IPTp-SP for all pregnant women and girls in locations with high or moderate malaria transmission, the therapy is contraindicated in HIV positive pregnant females who are taking a daily dose of co-trimoxazole, an antibiotic with anti-malarial properties. Furthermore, the emergence of resistance of the malaria parasite to co-trimoxazole leaves pregnant women and girls with HIV vulnerable to malaria infection. A study conducted in Kenya and Malawi from 2019-2021 found that monthly IPTp-DP taken in combination with daily co-trimoxazole by pregnant women with HIV was safe and effective. The cumulative risk of malaria infection during pregnancy or delivery was lower among females administered IPTp-DP plus co-trimoxazole compared to females who were taking a daily dose of co-trimoxazole alone (32). Further research is needed to test whether this drug combination is suitable and feasible to implement in the Asia Pacific region.

Ongoing Challenges and Opportunities

Despite the positive steps taken by some countries in the Asia Pacific region to address MiP using locally appropriate, context-specific interventions, various challenges remain. These include gaps in the MiP evidence base, the poor coverage of, and inequitable access to, existing MiP interventions, the low uptake of IPTp, and safety issues relating to anti-malarial drug use in the first trimester of pregnancy and among breastfeeding women. These issues are discussed below.

Gaps in the MiP evidence base: The recent work that has been done to estimate the global MiP burden provides helpful data to guide priority setting within national malaria programmes within the Asia Pacific region. However, significant gaps in the evidence base remain. This includes a lack of data on the true burden of *P. vivax* in pregnancy in the Asia Pacific region (18). The burden of MiP among women and girls with HIV is also under-researched within the region. Pregnant women and girls with HIV are highly vulnerable to malaria and yet have the least treatment options (20). In addition, very little is known about how the MiP burden differs at the sub-national level. In India, for instance, much more is known about the epidemiology of MiP in Madhya Pradesh and Chhattisgarh than in other areas of high endemicity, including states in the northeast of the country and Bihar and Uttarakhand. Tribal and forested areas are also under-researched (29). Understanding of how the MiP burden differs based on stratifiers such as age, poverty, disability or ethnicity is also limited. The WHO and other major development partners, such as the Global Fund, have for some time advocated for more systematic collection and analysis of routine and other malaria data disaggregated by sex, age and disability and other stratifiers (33,34). This needs to be taken forward within the context of MiP.

Further investment in social science research on the cultural, socio-economic, demographic and other barriers that prevent timely access to, and uptake of, MiP prevention, diagnosis and treatment is also needed. A comprehensive, equity-focused research agenda will be pivotal to the development of a systematic approach to addressing MiP in the Asia Pacific region.

At national level estimates of the MiP burden are commonly based on household survey data on malaria infection prevalence in children aged under five years old. This strategy has several limitations, including a lack of real-time data on MiP and a poor ability to detect trends in transmission in contexts where the burden is decreasing. The inability of national malaria programmes to provide an ongoing measure of the MiP burden is a significant gap. Insufficient granular information on the geographic distribution of the MiP burden means that priority-setting exercises lack essential data. This gap could be filled by introducing malaria surveillance at the first ANC visit (35).

Improving the coverage and equity of existing MiP interventions: In addition to new drug therapies and interventions, a concerted effort to improve the coverage and equity of current MiP interventions is needed. For example, in PNG, the percentage of pregnant women sleeping under an ITN the previous night was lower in 2023 than in 2009, despite the mass distribution of LLINs every three years and continuous distribution through ANC (36). In West Papua, Indonesia, only 23.2% of pregnant women in households with at least one ITN slept under a net the previous night (37). In India, the percentage of women sleeping under an ITN/LLIN the previous night ranged from 0.05 to 82.5% in seven studies, indicating significant geographical variability (29). This suggests a need for focused ethnographic research into the barriers that prevent the timely and consistent use of ITNs in specific contexts. It also highlights the need for a stronger focus on malaria prevention within ANC (38). Preventive information delivered during ANC needs to be backed up by social and behaviour change communication (SBCC) campaigns that focus specifically on pregnant women and girls. It will be important to develop SBCC tools and campaigns using participatory approaches that involve pregnant women to ensure maximum uptake by the target group. From a programmatic perspective, enhanced collaboration between malaria and maternal, newborn and child health (MNCH) programmes will be required (8).

Improving the uptake of IPTp: In sub-Saharan Africa (SSA), 80% of pregnant women attended ANC at least once in 2023, and uptake of the first, second and third doses of IPTp was 67%, 55% and 44% respectively (15). In PNG, uptake of the first and subsequent doses of IPTp was 45%, 42% and 24% respectively, significantly lower than the rates in SSA (36). In a recent update to its guidelines, WHO recommends that in contexts where access to ANC is challenging, countries should explore other delivery mechanisms for IPTp, including CHWs (19). In PNG, where a high proportion of the population lives in remote and hard-to-reach areas, community-based IPTp may be a useful strategy for delivering an essential MiP intervention closer to communities. Having convenient access to IPTp at the community level will help to reduce some of the costs associated with accessing health services. In addition, the delivery of a service in a culturally appropriate way by a known and trusted individual may help to address some of the other barriers to service uptake.

There may also be scope to adjust CHW strategies to extend pregnant women's access to malaria screening in some countries in the region. For example, ANC testing for malaria takes place in health facilities in Cambodia. The national malaria strategy supports community-based screening for malaria by CHWs, with active case detection prioritised in areas where there is a high burden of malaria and a concentration of forest goers. This means that pregnant women and girls with symptomatic or asymptomatic malaria who live in non-priority remote areas may not benefit from malaria information or services (4).

Safety of anti-malarial drug use during early pregnancy and by breastfeeding women: Women and girls are not always cognizant of their pregnancy status when accessing malaria diagnosis and treatment, especially in the first trimester. As a result, they may be exposed to anti-malarial drugs that are not recommended for use in the early stages of pregnancy. However, safety data on the impact of early exposure to contraindicated anti-malarial drugs is limited in many countries. There are also inadequate data on the safety of anti-malarial drugs administered to women and girls who are breastfeeding (39).

In response to these safety concerns, Medicine for Malaria Venture, through the Malaria in Mothers and Babies (MiMBa) initiative, has supported the establishment of pregnancy registries in Kenya and Burkina Faso. These collect data on exposure to anti-malarial drugs during the first trimester of pregnancy (39). The aim is to improve understanding of which drugs are safe to use during early pregnancy, thereby improving therapeutic options for this underserved group. Efforts are underway to expand the initiative to other countries, including those outside sub-Saharan Africa. For example, data from pregnancy registries in Indonesia were used to obtain safety data on exposure to the ACT dihydroartemisinin-piperaquine during the first trimester of pregnancy over a ten-year period. The study concluded that the drug does not significantly increase the risk of miscarriages, stillbirths and congenital anomalies compared to women treated with quinine (40). This helps to strengthen the evidence base on the safe use of anti-malarial drugs in the Indonesian context.

The MiMBa initiative is also exploring drug therapies that can safely be administered to breastfeeding women and girls.

Need for new point-of-care diagnostic tools to detect asymptomatic malaria: The high prevalence of asymptomatic malaria in pregnant women means that a large part of the MiP burden is being missed (9,41). Work is underway to develop and field test diagnostic tools with higher sensitivity to low parasite density infections. For example, the LAMP (loop-mediated isothermal amplification) diagnostic tool is more sensitive at detecting malaria parasites at low densities than other diagnostic methods that are used at the field level, namely microscopy and RDTs. PCR (Polymerase Chain Reaction) can detect malaria in individuals with low parasite densities but is primarily used in laboratory settings since it requires specialised equipment and highly trained staff. LAMP has a similar accuracy to PCR, produces results quickly (usually within an hour), and can be used at point-of-care in the form of an easy-to-use diagnostic kit. LAMP has been evaluated in several countries in the Asia Pacific, including China, Vietnam, South Korea and the Lao People's Democratic Republic (PDR) and found to be highly accurate (42-45). LAMP holds considerable potential to detect the large burden of asymptomatic malaria, which is thought to contribute between 20-50% of the total burden of human-to-mosquito transmission (46). Cost is a constraint to the roll-out of the technology in that LAMP is significantly more expensive than RDTs, although efforts are underway to develop cheaper versions.

In addition, field testing of ultra-sensitive RDTs (uRDT) that target the antigen histidine-rich protein 2 (HRP2) in *P. falciparum* malaria is also underway. Because they are based on an existing, widely used technology, they have good potential to be widely adopted in low-resource settings (47). In a malaria prevalence survey implemented in a low transmission area in Myanmar, the uRDT outperformed both regular RDTs and microscopy at low parasite densities (48).

Potential of other innovative technologies: The use of drones to deliver vaccines and other medical products has the potential to improve timely access of pregnant women living in hard-to-reach communities to malaria drugs and commodities, including LLINs, RDTs and even drugs for IPTp. This innovative technology has been tested in a number of countries, including Vanuatu and India, where delivery times for drugs and medical commodities have been substantially reduced (49,50). In Bayelsa State, Nigeria, drones have also been used to deliver malaria vaccines in hard-to-reach areas, helping to prevent stock-outs and reducing missed immunisations (51).

Use of SMS text message reminders may also help to improve adherence to IPTp. In Guinea, women who sent an SMS reminder were 48 times more likely to attend ANC and 12 times more likely to receive all IPTp doses than other women. This technology could be tested in countries in the Asia Pacific region that are implementing IPTp (52). The use of a mobile health (mHealth) app to augment the awareness-raising activities of CHWs in tribal communities in Jharkhand, India, significantly improved awareness of positive maternal health behaviours in intervention compared to control sites (53). This technology has the potential to be utilised to support the work of CHWs in other rural and remote areas in the region.

Table 2: MiP Challenges and Opportunities in the Asia Pacific Region

Challenge / Documented Gap	Description	Opportunities
Lack of data on the burden of MiP in the Asia Pacific region	Limited data on MiP at sub-national level, among HIV+ women and girls, or based on stratifiers such as age, ethnicity, disability, or poverty	- Adapt surveillance systems to provide a continuous measure of the MiP burden (e.g. malaria surveillance at first ANC visit) - Disaggregate surveillance data by key stratifiers - Prioritise qualitative social science, including ethnographic research, to explore differences in MiP by key stratifiers
Limited preventive interventions for MiP in the Asia Pacific region and low uptake of existing preventive interventions	- Preventive interventions recommended by WHO in the Asia Pacific region are ITNs and early detection and effective case management of malaria. IPTp is currently not recommended. Unless pregnant women at risk of MiP use an ITN, they risk exposure to malaria - Low uptake of preventive interventions for MiP in some countries / localities	- Explore opportunities to pilot IPTp-DP in high transmission settings in the region - Consider piloting community-based IPTp in high burden malaria settings where there are severe barriers of access to ANC (e.g. PNG) - Research the barriers to uptake of existing preventive interventions for MiP - Prioritise malaria prevention in ANC - Design SBCC campaigns on MiP - Consider use of new technologies (e.g. drones to deliver MiP drugs/commodities in hard-to-reach areas, SMS reminders for ANC/IPTp or mHealth apps)
Limited anti-malarial drugs suitable for use in all stages of pregnancy and by women and girls with HIV	- IPTp is not recommended for use during the first trimester of pregnancy - Few safe treatment options for uncomplicated malaria in the first trimester of pregnancy - Limited evidence on options for safe treatment of uncomplicated malaria for pregnant women with HIV in the Asia Pacific region	- Factor the needs of pregnant women and girls into the pipeline of new anti-malarial drugs - Prioritise the development/clinical trial of drugs that can be safely used for prevention and treatment during the first trimester - Undertake research on the safe use of ACTs (other than AL) in the first trimester - Research alternative anti-malarial drug options for women with HIV in the Asia Pacific (e.g. IPTp-DP plus co-trimoxazole)
Lack of sensitivity of rapid diagnostic tests for malaria	Current RDTs lack sensitivity to diagnose subpatent malaria	- A new generation of RDTs with improved sensitivity (e.g. uRDTs) are currently being field tested. Further evaluation is required before these are adopted across the region. - Other diagnostic technologies such as LAMP also warrant further testing in the region
Increasing drug resistance	There is evidence of increasing resistance of malaria parasites to anti-malarial drugs. This includes SP (used for IPTp) and co-trimoxazole (used to treat uncomplicated malaria in pregnant women with HIV)	Clinical trials tested the efficacy and safety of IPTp-DP as an alternative to IPTp-SP in Papua, Indonesia. PNG is currently implementing a trial into the efficacy and safety of IPTp-SP plus DP. This research will provide crucial data to guide the roll-out of IPTp in other high transmission settings in the Asia Pacific region
Safety issues relating to use of anti-malarial drugs during early pregnancy or by lactating women	- Women and girls who are unaware of their pregnancy status when seeking treatment for suspected malaria may be administered anti-malarial drugs that are not recommended for use during the first trimester - Limited data on the safe use of anti-malarial drugs by breastfeeding women and girls	- Establish pregnancy registries (to collect safety data on the use of anti-malarial drugs in early pregnancy) in the Asia Pacific region - Train health workers in the safe administration of anti-malarial drugs - Prioritise research into the safe use of anti-malarial drugs by lactating women and girls

Conclusion

Although pregnant women and girls are categorised as a high-risk group for malaria, this is currently not reflected in the scope or scale of programmatic investments in MiP in the Asia Pacific region. Addressing the malaria burden in pregnant women and girls as a highly underserved group is a key strategy for social inclusion and the promotion of health equity, both of which are crucial for the advancement of malaria elimination.

Ultimately, achieving malaria elimination will remove the risk of malaria in pregnancy altogether, reducing the size of the at-risk group to zero. However, this outcome cannot be realised unless countries deliberately address MiP as part of their elimination strategies. Without targeted approaches, pregnant women and girls will continue to face disproportionate risks, and elimination efforts themselves may be compromised. Individual countries within the Asia Pacific region require a systematic strategy for reducing the burden of MiP. More evidence on the scale and characteristics of the MiP burden at the sub-national level is required, as is evidence on effective intervention strategies in different transmission contexts. An equity-focused research strategy will be pivotal to driving forward progress.

Research into new drug therapies for pregnant women and girls needs to be designed and implemented to address the contextual specificities of the Asia Pacific region, where malaria transmission is heterogeneous, malaria vectors are different to those in SSA, and where drug resistance is an increasingly important challenge. In addition, both qualitative and quantitative research will be needed to establish which programmatic interventions are the most effective, acceptable and appropriate from clinical and user perspectives, and provide the best value for money for national malaria programmes. There are currently few well-documented examples of good practice interventions in the region. This underscores the need for countries to share experience and lessons learned.



Precautionary malaria test in Papua New Guinea. Photo by Youth With A Mission

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