

Back to school for malaria prevention: a new tool in the era of malaria elimination?



Children and pregnant women are at increased risk of malaria. Among children, research to date has focused on preschool children (aged <5 years) because this age group has the highest malaria death and illness rates of malaria illness and deaths. With changing malaria endemicity, however, vulnerability patterns among children of different age groups might change.¹ Furthermore, children aged 5–15 years predominantly have the highest risk of asymptomatic malaria and gametocytaemia, and yet low use of long-lasting insecticide treated nets, which puts them at risk.^{1,2} As part of global efforts to reduce and eliminate malaria transmission, it is only logical to find effective malaria prevention strategies for school children.

Prevention strategies such as intermittent preventive treatment have been recommended for pregnant women, infants, and, in Sahelian countries, children younger than 5 years as part of seasonal malaria chemoprevention. Currently, there is no WHO recommendation for malaria prevention among school children in sub-Saharan Africa. The systematic review by Lauren Cohee and colleagues³ offers the first comprehensive review and meta-analyses of the effects of different prevention strategies on outcomes in school children. School malaria prevention programmes in 13 included studies showed reduced asymptomatic (11 studies) and clinical malaria by approximately 50% (4 studies), and reduced anaemia by 15% (11 studies), whereas there was a marginal effect on cognitive function in children above 10 years (5 studies). These improvements in the health and academic performance in children are impressive. Furthermore, some trials reported a reduction in gametocytaemia in the intervention group^{4,5} and one study⁶ noted a small but significant reduction in community transmission. These results deserve review by policy makers to identify what further evidence is needed before recommending school-based malaria programmes, and discussion with national programmes on how school-based strategies might be funded and implemented.

Further evidence might be needed on the effects of malaria treatment on cognitive ability using different

types of cognitive tests, and on the effects of school treatment and school holidays (without treatment) on malaria transmission in the community and child health. Cost-effectiveness analyses to help national malaria programmes assess cost-benefits would also be useful in addition to guidance on factors important for selecting the type of intervention. Most studies included in the review used some form of intermittent preventive treatment. The only study which used screening and treatment did not show a reduction in parasitaemia;⁷ indeed, trials on screen and treat strategies in pregnancy trials also showed no clear advantage over intermittent preventive treatment for pregnant women.⁸ As Cohee and colleagues point out, rapid diagnostic malaria tests might not be sensitive enough to detect malaria. Further considerations are that a strategy that does not use rapid diagnostic malaria tests simplifies training, reduces the risks of taking blood and reduces cost. Chemotherapy, used in one older study, was effective but requires adherence.

When considering intermittent preventive treatment, malaria transmission and seasonality will inform frequency of dosing or the timing of the doses, as in seasonal malaria chemoprevention. Beneficial effects of intermittent preventive treatment in children were seen in areas of low and high low transmission, but reductions in *Plasmodium falciparum* parasitaemia was higher when using drugs with longer prophylactic effects. In the high transmission setting of Côte d'Ivoire, three-monthly sulfadoxine-pyrimethamine alone (ie, not in combination with other drugs) did not show a beneficial effect on *P falciparum* parasitaemia,⁹ which is somewhat surprising given the low levels of sulfadoxine-pyrimethamine resistance in west Africa.¹⁰ It is likely that the frequency of dosing (three-monthly) was insufficient because of the high re-infection rates observed. To achieve a protective dose of intermittent preventive treatment in high transmission areas, monthly doses with drug combinations with at least one drug with a long half-life might be needed, whereas less frequent doses are required in areas of low transmission. In areas of seasonal malaria, a dose given at the end of the rainy season appears to go a long way.⁵

Lancet Glob Health 2020

Published Online
October 22, 2020
[https://doi.org/10.1016/S2214-109X\(20\)30347-8](https://doi.org/10.1016/S2214-109X(20)30347-8)

See Online/Articles
[https://doi.org/10.1016/S2214-109X\(20\)30325-9](https://doi.org/10.1016/S2214-109X(20)30325-9)

Combination therapies seem effective and could reduce the development of drug resistance; however, studies and programmes need to consider the choice of drug in the context of national first-line treatment policy to safeguard first-line malaria therapies. There were no reports of any new adverse events in any of the included studies that reported on side-effects. How well malaria prevention school programmes will work in real-life settings has not been assessed, and feasibility and acceptability studies, which address adherence, are needed. Lessons should be learned from treatment of pregnant women; after almost 30 years of implementation of a one-dose drug, coverage with intermittent preventive treatment for pregnant women is far from optimal.¹¹ We should learn from other prevention strategies such as seasonal malaria chemoprevention, which has been successful in achieving high rates of coverage.¹¹ Importantly, malaria preventive strategies in schools will have health and educational benefits for children and can also contribute to reductions in community transmission. That is a goal worth fighting for.

We declare no competing interests.

Copyright © 2020 The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 license.

*Anna Maria van Eijk, Jenny Hill
anna.vaneijk@lstmed.ac.uk

Department of Clinical Sciences, Liverpool School of Tropical Medicine, Liverpool L3 5QA, UK

- 1 Brooker SJ, Clarke S, Fernando D, et al. Malaria in middle childhood and adolescence. In: Bundy DAP, Silva N, Horton S, Jamison DT, Patton GC, eds. *Child and Adolescent Health and Development*. Washington, DC: World Bank Group 2017: 183–98.
- 2 Coalsen JE, Cohee LM, Buchwald AG, et al. Simulation models predict that school-age children are responsible for most human-to-mosquito *Plasmodium falciparum* transmission in southern Malawi. *Malar J* 2018; **17**: 147.
- 3 Cohee LM, Opondo C, Clarke SE, et al. Preventive malaria treatment among school-aged children in sub-Saharan Africa: a systematic review and meta-analyses. *Lancet Glob Health* 2020; published online Oct 22. [https://doi.org/10.1016/S2214-109X\(20\)30325-9](https://doi.org/10.1016/S2214-109X(20)30325-9).
- 4 Nankabinwa JJ, Wandera B, Amuge P, et al. Impact of intermittent preventive treatment with dihydroartemisinin-piperaquine on malaria in Ugandan schoolchildren: a randomized, placebo-controlled trial. *Clin Infect Dis* 2014; **58**: 1404–12.
- 5 Clarke SE, Rouhani S, Diarra S, et al. Impact of a malaria intervention package in schools on *Plasmodium* infection, anaemia and cognitive function in schoolchildren in Mali: a pragmatic cluster-randomised trial. *BMJ Glob Health* 2017; **2**: e000182.
- 6 Staedke SG, Maiteki-Sebuguzi C, Rehman AM, et al. Assessment of community-level effects of intermittent preventive treatment for malaria in schoolchildren in Jinja, Uganda (START-IPT trial): a cluster-randomised trial. *Lancet Glob Health* 2018; **6**: e668–79.
- 7 Halliday KE, Okello G, Turner EL, et al. Impact of intermittent screening and treatment for malaria among school children in Kenya: a cluster randomised trial. *PLoS Med* 2014; **11**: e1001594.
- 8 Desai M, Hill J, Fernandes S, et al. Prevention of malaria in pregnancy. *Lancet Infect Dis* 2018; **18**: e119–32.
- 9 Rohner F, Zimmermann MB, Amon RJ, et al. In a randomized controlled trial of iron fortification, anthelmintic treatment, and intermittent preventive treatment of malaria for anemia control in Ivorian children, only anthelmintic treatment shows modest benefit. *J Nutr* 2010; **140**: 635–41.
- 10 Flegg JA, Patil AP, Venkatesan M, et al. Spatiotemporal mathematical modelling of mutations of the dhps gene in African *Plasmodium falciparum*. *Malar J* 2013; **12**: 249.
- 11 WHO. World Malaria Report 2019. 2019. <https://www.who.int/publications/i/item/world-malaria-report-2019> (accessed July 17, 2020).