

Evaluation of malaria transmission intensity using antibody responses to plasmodium falciparum merozoite surface protein-119 after vector control in Western Kenya

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The scale up of malaria control strategies such as insecticide-treated bednets (ITNs) and indoor residual spraying (IRS) have reduced malaria cases and deaths in many malaria endemic areas. However, it is difficult to accurately quantify the reduction in the malaria burden in endemic areas because the common methods of assessing transmission intensity are imprecise, unreliable and costly. Therefore, there is need to evaluate better alternatives for estimating malaria disease transmission. In this study, antibody levels to Plasmodium falciparum merozoite surface protein-Ire (MSP-b9) was used to evaluate trends in malaria transmission after vector control using combined ITNs plus IRS and ITNs alone in Rachuonyo and Nyando districts respectively in western Kenya. Serum from 5,839 children and adults collected during cross-sectional surveys conducted before and after vector control were tested for anti-MSP-119 immunoglobulin G (IgG) antibodies by enzyme-linked immunosorbent assay (ELISA). Antibody levels were compared as continuous optical density (OD) values and age specific sero-positivity rates were used to estimate sero-conversion rates. The prevalence of antibodies to P. falciparum MSP-119 were significantly reduced in the ITNs+IRS district from 60.5 % (95% CI: 57.7 - 62.8) to 48.7% (95% CI: 44.9 - 49.5) after the intervention, ($X^2 = 11.762$, $df = 1$, $P = 0.001$). In contrast, there was only marginal reduction in sero-prevalence in the control ITNs+No-IRS district, from 48.3% (95% CI: 44.5- 51.0) to 47.2% (95% CI: 46.1 - 50.7) ($X^2 = 3.307$, $df = 1$, $P = 0.069$). There was a reduction in the age-specific sero-conversion rates from $A. = 0.1272$ to $A. = 0.0571$ in ITNs+IRS district and from $A. = 0.1070$ to $A. = 0.0607$ in the ITNs+No-IRS district at the two time points. There was also a significant reduction in the parasite prevalence from 8.6% (95% CI: 7.2 - 10.1) to 6.9% (95% CI: 5.8 - 8.2) in the ITNs+IRS district following the intervention ($P = < 0.001$). In contrast, parasite prevalence increased significantly in ITNs+No-IRS district from 10.4 % (95% CI: 8.5 - 12.5) at baseline to 20.4% (95% CI: 18.5 - 22.3) at the second survey ($P = < 0.001$). Similarly, anaemia prevalence was reduced in the ITNs+IRS district from 23.2%, (95% CI: 21.1 - 25.5) to 19.2% (95% CI: 17.4 - 21.0), whereas there was no change in anaemia prevalence in ITNs+No-IRS district at baseline and survey two. Similar trends in antibody responses to MSP-119 and parasitaemia and anaemia prevalence rates suggests that sero-prevalence data can be a useful tool in monitoring trends in malaria transmission after roll out of an intervention. This might be useful in monitoring the burden of malaria in areas of declining parasite and anaemia prevalence after scaling up on malaria interventions