It is hypothesized that the use of bed-nets, especially in high malaria transmission areas, could lead to alterations in the acquisition and maintenance of malaria-specific immunity in young children and pregnant women, consequently shifting the burden of disease of older children and multigravidae women. As part of a large community-based trial on the efficacy of Insecticide-treated bed-nets (ITNs) on childhood morbidity and mortality in an area of intense perennial malaria transmission in western Kenya, the effects of bed-nets on humoural and cellular immune responses to well characterized malaria vaccine candidate antigens were investigated in young children and pregnant women.

Antibody responses to P. falciparum pre-erythrocytic antigens, Circumsporozoite Protein (CSP) and Liver Stage Antigen (LSA-1) and blood stage antigen (MSP-1) were tested by standard enzyme linked immunosorbent assay (ELISA) in a total of 2779 children under 3 years of age enrolled in 3 morbidity cross-sectional surveys conducted before and after the bed-net trial. Antibody responses to the 32 antigens were also tested in paired maternal/cord plasma samples obtained from 296 women (intervention villages N=157, control villages N=139) who has singleton normal deliveries between September 1997 and October 1998, 1 year after the introduction of bed-nets. In addition, blood samples from a subset of children enrolled in 2 cross-sectional surveys were tested for cellular proliferative responses to LSA-1 and MSP-1 antigens by thymidine incorporation assay.

Fourteen and 22 months after the introduction of bed-nets, the frequencies and levels of total IgG and IgG subclasses 1-3 to LSA-1 and total IgG to CSP were significantly lower in children from bed-net villages than in children from control villages ($P<0.001$ for all). In contrast, the frequencies of total IgG and IgG1 to MSP-1 antigen were significantly higher in children from bed-net villages than in children from control villages at 14 months ($P=0.0069$ and 0.029 respectively) but not at 22 months after bed-net intervention.

In paired mother/cord plasma samples, The prevalence and levels of total IgG and subclasses 1-3 to LSA-1 and total control villages than in women from bed-net villages. In contrast, the prevalence and levels of total IgG to CSP were significantly higher in women from bed-net villages than in women from control villages. In cord plasma, the prevalence and levels of anti-MSP-1 IgG3 were significantly higher in cord samples from control villages than from bed-net villages. In a linear regression model controlling for gravida and season of birth, there was a significant negative association between maternal and cord IgG levels in bed-net areas. These results suggest that the use of bed-nets decreases antibody responses to LSA-1 and MSP-1 antigens but increase antibody response to CSP in pregnant women. In addition, at low levels of maternal anti-CSP IgG, the use bed-nets is associated with significantly higher cord antibody levels. In conclusion, contrary to the belief that ITNs might interfere with acquired immunity to malaria, the results obtained from these studies suggest that, on the contrary, the use of ITNs could improve the acquisition of protective clinical immunity in young children and the transplacental transfer of anti-CSP antibodies in areas of high malaria transmission