ABSTRACT

Malaria remains prevalent in many parts of Kenya but areas in the highlands of Nandi North sub-county have reported declining incidences of malaria infection and disease burden, and between April 2007 and March 2008 a possible interruption of transmission was reported. Given the low transmission intensity in the current study sites, it is not clear if fever and/or a combination of other symptoms are accurate predictors of malaria diagnosis. Relationship between malaria and anaemia is well documented. However, spatial autocorrelation of malaria and anaemia before and after reported interruption of transmission is not well understood. After a reported interruption of transmission in the current study sites between April 2007 and April 2008, new malaria cases have been documented. It is not clear if these cases are newly imported or are representative of an existing transmission reservoir. The study objectives were to: determine the predictive value of fever and/or other malaria symptoms for *P. falciparum* parasitemia among individuals seeking treatment in highland areas of very low transmission; determine spatial association between anaemia prevalence and previous malaria incidence before and after reported interruption of transmission and; determine if new malaria cases reflect existence of transmission hotspots in highland areas of very low malaria transmission. The study design used both retrospective (2003-2009) and prospective (2010-2012) review and monitoring of clinical, climatic, demographic and entomologic data respectively. A total of 3420 asymptomatic individuals and 1682 households were sampled. Sensitivity, specificity likelihood ratios were analyzed using STATA and R, spatial autocorrelation was determined using ArcGIS and SaTScan while correlation was determined using STATA. Malaria hotspots were determined using ArcGIS and SaTScan. $P<0.05$ was considered significant for all analysis. The findings of the study show that in areas of low, unstable malaria transmission, fever and/or combination of symptoms is not sensitive for clinical diagnosis of malaria in children <5 years, and in individuals ≥5 years. Fever had 55.8% sensitivity and 54.4% specificity for parasitaemia for < 5 years. The addition of headache increased sensitivity for parasitemia to 94.4% in children <5 years, and to 96.8% in individuals ≥5 years but decreased specificity to 9.9% and 11.6%, respectively. For children < 5 years, malaria incidence spatially correlated with anemia prevalence in Kapsisiywa only (p < 0.001) but not for Kipsamoite. For individuals ≥5 years, malaria incidence spatially correlated with anemia prevalence both in Kapsisiywa (p = 0.001) and Kipsamoite (p < 0.001). SaTScan analysis detected one hotspot in children < 5 years both in Kipsamoite (p< 0.001) and Kapsisiywa (p = 0.003). For individuals ≥ 5 years, Kipsamoite had 2 significant hotspots accounting for 9% of all households and 45% of total malaria cases (p < 0.001 and p = 0.002) while in Kapsisiywa, 3 significant hotspots covering 42% of all households and accounted for 71% of total malaria cases (p < 0.001, p < 0.001 and p = 0.003). The study concludes that screening for symptoms in addition to fever does not accurately capture all cases of clinical malaria in < 5 years and individuals ≥5 years old in areas of low malaria transmission; malaria and anemia are spatially correlated for individuals ≥5 in both sites but only spatially correlated in Kapsisiywa for children < 5 years and that there exist malaria hotspots in both sites. It does not conclusively determine if new malaria cases after reported interruption of transmission are a reflection of new infections or existence of malaria transmission reservoirs. The study recommends parasitological diagnosis, use of spatial approaches for malarial-anaemia interventions and parasite genotype confirmation to ascertain new malaria cases.