Evaluation of the long-term impact of control interventions on the population size, age structure and biting behavior of the malaria vector, anopheles arabiensis

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Malaria remains a major cause of morbidity and mortality in sub-Saharan Africa. Worldwide malaria morbidity is estimated to be 438,000 million cases, and malaria- related mortality is estimated to be over 627,000 deaths each year of which 80% occur in sub-Saharan Africa. Current interventions have reduced malaria transmission to a recommendable rate. However, residual malaria transmission is still responsible for malaria cases in many African countries. Although factors such as insecticide resistance, behavioral shift and zoophily have been associated with the residual malaria transmission, there are other factors, which need to be investigated. This study focused on the evaluation of long-term impact of control interventions on the age composition of the malaria vector Anopheles arabiensis population. The study was conducted at the Ifakara Health institute (IHI) in a large semi field system. Nine (9) compartments, self-sustaining malaria vector populations were established. Three compartments were used as controls; two were supplied with ITN alone, two compartments had ITN and eave buffles (ITN+EV), and the remaining two compartments had ITN and Ivermectin (ITNs + IV), Nine (9) An. arabiensis populations were maintained in the 9 compartments and changes in population size were monitored for a total of 42 weeks (pre and post intervention). The female An. arabiensis were sampled by Human Landing Catch (HLC) before taken to the laboratory for age grading analysis using Near Infrared Spectroscopy (NIRs). While the population size of An. arabiensis in the control compartments continued to grow, the abundance of female An. arabiensis was significantly reduced in the compartments where interventions were introduced. Introduction of ITN alone and ITN with eave baffles reduced the An. arabiensis population size by 11% and 10%, respectively. However, the combination of ITNs and Ivermectin reduced the abundance of An. arabiensis to near elimination. The biting behaviour of An. arabiensis was also affected by the interventions ($F = 0.440$, $DF = 3$ $P > 0.05$). The age composition of An. arabiensis in the four populations where interventions were introduced was highly affected ($F = 9.162$, DF i 3, $P = 0.027$). The study highlights the impact of ITNs on the age composition of female An.

arabiensis populations by removing from the population older females than young females. The impact of Ivermectin on both young and older ages of female An. arabiensis populations was also evident. The study recommends the use of an integrated vector control approach such as ITNs and Ivermectin where both age groups are affected to control malaria transmission.