Mosquito Infestation of Hospital settings in Zanzibar

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Aim

To assess the mosquito species composition, abundance and associated risks across selected District Hospitals in Zanzibar to inform subsequent intervention trials to prevent human-vector contact in hospital settings.

Introduction

Epidemic transmission of mosquito-borne diseases (MBDs), including malaria and dengue, pose an increasing public health risk in the archipelago of Zanzibar (Kooiman et al.2025, Saleh et al.2021)
Mosquito-infested hospitals may facilitate pathogen transmission from infected patients to healthcare workers, visitors, and surrounding communities serving as focal points for epidemic initiation and spread (Yakubu et al.2022, Ehelepola et al. 2018)

Methods

A longitudinal entomological survey was conducted from June 2024 to December 2025 across four purposely selected District Hospitals on the island of Unguja, Zanzibar (Fig1). Adult mosquitoes were collected once a month at each hospital through indoor and outdoor captures using BG-Pro (Biogents AG), Furvela tent-traps and ProkoPack™ aspirators (Fig 2). All captures were identified to species level using standard morphological keys. Risk factors for mosquito infestation were determined using negative binomial model.

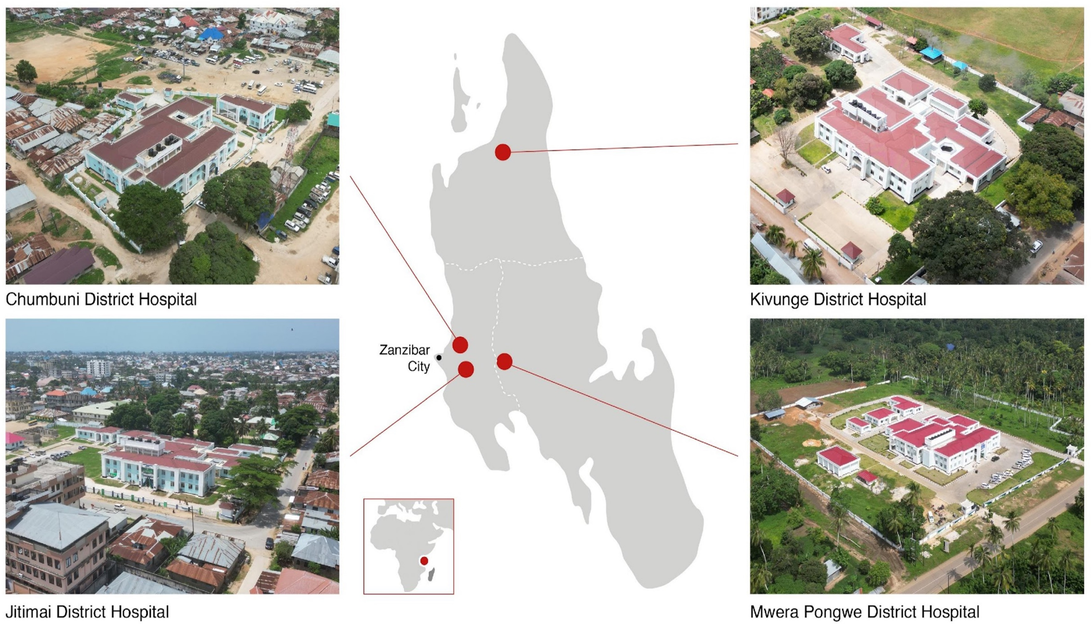


Fig. 1. Location and ariel view of the four study sites on Unguja Island, Zanzibar (Source: Sloan Wood, Lupenza et al. 2025)



Fig. 2. Adult mosquito collection methods: a) BG-Pro (Biogents AG, b) Furvela tent-trap (Photos: Eliza Lupenza)

Results

A total of 95,983 adult mosquitoes were captured across all four hospitals including:

- Outdoor areas: 59,788 (62%)
- Indoor waiting areas: 30,797 (32%)
- Patient wards: 5,398 (6%)
- More than 10 species were identified including important disease vectors *An. gambiae, An. funestus, Ae. aegypti, Ae. simpsoni, and Cx. quinquefasciatus* (Table 1)

Table 1. Mosquito species composition and abundance across all four hospital sites on Unguja Island.

Mosquito species	Chumbuni	Jitimai	Kivunge	Mwera-Pongwe	Total number (%)
An.gambiae	13	6	3	50	72 (0.07)
An.funestus	0	0	1	1	2 (<0.01)
Ae.aegypti	185	276	68	43	572 (0.59)
Ae.simpsoni	169	194	41	106	510 (0.53)
Other Aedes	0	0	0	2	2 (<0.01)
Cx. quinquefasciatus	13,028	19,974	44,272	15,570	92,844 (96.70)
Cx.cinerellus	72	447	227	102	848 (0.88)
Cx.cinereus	3	3	39	3	48 (0.05)
Other *Culex*	2	7	1	0	10 (0.01)
Mansonia spp	45	987	4	15	1,051 (1.09)
Other species	6	3	11	4	24 (0.03)
Total	**13,523**	**21,897**	**44,667**	**15,896**	**95,983**

The risk of infestation (incidence rate ratio) by important vectors species varied across hospitals, location and season (Fig.3). Notably, the risk of infestation was higher during rainy than dry season for *Aedes aegypti* (IRR = 1.66, 95% CI: 1.27–2.18) and *Aedes simpsoni* (IRR = 3.57, 95% CI: 2.58–4.96), whereas it was significantly lower for *Culex quinquefasciatus* (IRR = 0.74, 95% CI: 0.70–0.78).

The risk of infestation was significantly higher outdoors than indoors for all three species i.e., *Ae. aegypti* (IRR = 7.80, 95% CI: 5.78–10.60), *Ae. simpsoni* (IRR = 5.45, 95% CI: 3.92–7.63) and *Cx. quinquefasciatus* (IRR = 2.10, 95% CI: 1.98–2.22).

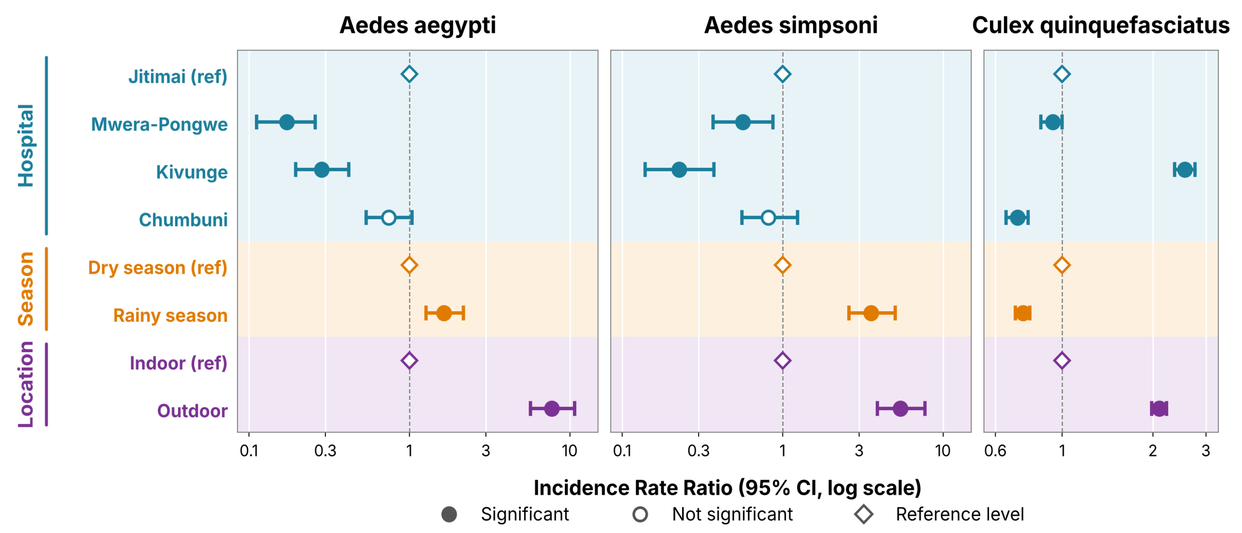


Fig.3. Risk factors for hospital infestation by main vector species identified across study sites

Conclusion

- Vectors of public health concern thrive in and around hospital facilities in Zanzibar
- Hospitals may serve as foci of future MBD outbreaks
- Urgent need for integrated mosquito control interventions targeting multiple species
- The MBD-free project is currently conducting a trial of integrated mosquito control solutions co-created with patients, hospital staff and management.

MBD-Free Project

This research is part of the Danida funded MBD-Free Project. This inniative brings together researchers from the global north and south to explore the key role hospitals may play in the initiation and spread of mosquito-borne diseases (MBDs), and their prevention and monitoring through co-created control interventions and sentinel surveillance in Zanzibar district hospitals.

MBD-FREE

Collaborating entities

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