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Community evaluation of three-dimensional window double screens in reducing malaria transmission

Submission date
18/10/2022

Recruitment status
No longer recruiting

Registration date
28/10/2022

Overall study status
Completed

Last Edited
25/06/2025

Condition category
Infections and Infestations

[_] Prospectively registered
[X] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol

Background and study aims
Vector-borne diseases such as malaria can be prevented by minimizing man-mosquito contact. This is traditionally achieved by using window screens and bednets. Researchers have developed a mosquito screen that can allow mosquitoes to penetrate it from one side but not the opposite side (i.e., a unidirectional screen). When this screen is used for house screening in a double screen setup, in a way similar to window double glazing in western countries, it will trap mosquitoes trying to enter or escape through the window due to the physical characteristics of the unidirectional screen, so the researchers call it the 3D screen. The window double screen setup was tested in the laboratory and in semi-field experimental hut conditions and was found to be effective in capturing mosquitoes. The aim of this study is to evaluate the effectiveness of the 3D screen in a window double setup in real-world field conditions in reducing mosquito populations and malaria transmission.

Who can participate?
Households in a malaria endemic area

What does the study involve?
The study involves the installation of window double screens on houses followed by measuring indoor mosquito densities and malaria prevalence in five surveys.

What are the possible benefits and risks of participating?
There will be direct benefit for participants as the study will improve the houses of the participants and will provide free insecticide-treated bednets to both intervention and control households. There is always a small risk with blood sampling for malaria screening and this will be minimized by using a finger-prick blood sampling method. Screened children will be provided with malaria diagnosis, free treatment, medical advice, and referral for other symptoms. The 3D-window double screens are designed to reduce mosquito populations and malaria transmission in endemic areas. If the intervention proves to be effective in the real-world situation, it will improve wellbeing, quality of life and the economic status of the targeted areas resulting from less malaria episodes.

Where is the study run from?
The study will be run by the University of Helsinki, Finland, and Amani Research Centre, NIMR, Muheza, Tanzania. It will take place in the Muheza district in north-eastern Tanzania.

When is the study starting and how long is it expected to run for?
May 2019 to August 2021

Who is funding the study?
University of Helsinki and Jane & Aatos Erkko Foundation (Finland)

Who is the main contact?
Dr Ayman Khattab
ayman.khattab@helsinki.fi

Contact information

Type(s)
Principal investigator

Contact name
Dr Ayman Khattab

ORCID ID
https://orcid.org/0000-0002-3980-8379

Contact details
Department of Bacteriology and Immunology
Haartman Institute (Haartmaninkatu 3)
University of Helsinki
P.O.Box 21
Helsinki
Finland
00014
+358 (0)2941 26 395
ayman.khattab@helsinki.fi

Additional identifiers

Clinical Trials Information System (CTIS)
Nil known

ClinicalTrials.gov (NCT)
Nil known

Protocol serial number
2242/2021

Study information

Scientific Title
A cluster-randomized controlled Phase III evaluation of 3D window double screens (3D-WDS) in reducing malaria transmission when combined with pyrethroid-treated long-lasting insecticidal net in north-eastern Tanzania

Acronym
3D-WDS

Study objectives
Mosquitoes' host-seeking behavior could be exploited to trap them in a window double screen trap setup. Mosquito screens that can permit mosquitoes to pass through it from one side but not from the other side, forming a trap in a double screen setup, would be an ideal solution to control mosquito populations and malaria transmission

Ethics approval required
Old ethics approval format

Ethics approval(s)
1. Approved 29/05/2019, National Institute for Medical Research ethics committee (3 Barack Obama Drive, PO Box 9653, 11101 Dar es Salam, +255 (0)222121400, nimrethics@gmail.com), ref: NIMR/HQ/R.8a/Vol.IX/3118
2. Approved 28/04/2022, Helsinki and Uusimaa Hospital District medical research ethics committee (Topeliuksenkatu 5, 00260 Helsinki, +358 (0)403594618, eettiset.toimikunnat@hus.fi), ref: 2242/2021

Study design
Two-arm cluster-randomized controlled cross-sectional study

Primary study design
Interventional

Study type(s)
Prevention

Health condition(s) or problem(s) studied
Malaria

Interventions
20 clusters from 17 villages across Muheza district in the northeast of Tanzania were profiled based on the malaria point prevalence, malaria vector densities and level of insecticide resistance. A strong positive correlation was observed between the number of female Anopheline gambiae population and malaria prevalence therefore cluster selection was primarily based on malaria prevalence. The standard deviation of malaria prevalence from all 20 clusters was calculated and 14 clusters within the standard deviation were selected to participate in the study. Six clusters above and below the standard deviation were not selected to participate in the study. The remaining 14 clusters were further randomized into control (seven clusters) and intervention (seven clusters) for a two-armed cluster randomized controlled trial. Randomization was performed in R (version 3.5.2) using the randomizeR package (version 1.4.2.).

The number of houses targeted to participate in the study will be 50 houses per cluster. The field study will run for 50 weeks. All study participants will receive an insecticide-treated bednet recommended for use by the Tanzanian health authorities. Houses of the study participants that fall within the clusters selected for the 3D window double screen (3D-WDS) installations will receive some house improvements in the form of fitting mosquito nets (3D-WDS) on the windows of their houses. The households will be visited every 10 weeks for a total of five visits during the lifetime of the project to examine one or more children living in the house for malaria. Indoor mosquito densities will be also measured at the same intervals using CDC-light traps in 20 houses per cluster for one night (4 days of collection from 5 houses per night).

Intervention Type
Other

Primary outcome(s)
Malaria prevalence measured using a rapid diagnostic test and thick blood smear at baseline, 10, 20, 30, 40 and 50 weeks

Key secondary outcome(s))
Current secondary outcome measures as of 11/09/2024:
1. Anemia prevalence determined by measuring hemoglobin level using the Hemocue device at baseline, 10, 20, 30, 40 and 50 weeks
2. Body temperature measured using an infrared thermometer at baseline, 10, 20, 30, 40 and 50 weeks
3. Bio-metrics (height, weight and MUAC) measured using a measuring tape and weight scale at baseline, 10, 20, 30, 40 and 50 weeks
4. Indoor mosquito density measured using CDC-light traps at baseline, 10, 20, 30, 40 and 50 weeks
5. Entomological inoculation rate measured using CDC-light traps and RT-PCR at baseline, 10, 20, 30, 40 and 50 weeks
6. Acceptability of intervention measured using focus group discussions and interviews starting from week 50 over 3 weeks

Previous secondary outcome measures:
1. Anemia prevalence is determined by measuring hemoglobin level using the Hemocue device at baseline, 10, 20, 30, 40 and 50 weeks
2. Body temperature is measured using an infrared thermometer at baseline, 10, 20, 30, 40 and 50 weeks
3. Bio-metrics (height, weight and MUAC) are measured using a measuring tape and weight scale at baseline, 10, 20, 30, 40 and 50 weeks
4. Indoor mosquito density is measured using CDC-light traps at baseline, 10, 20, 30, 40 and 50 weeks
5. Acceptability of intervention is measured using focus group discussions and interviews starting from week 50 over 3 weeks

Completion date
31/08/2021

Eligibility

Key inclusion criteria

1. Traditional Tanzanian village house with at least a single window or outlet which can accommodate the 3D-WDS and at least a single sleeping space
2. House made for long-term residential purposes (at least for the duration of the study)
3. At least one child aged 6 months - 14 years sleeping inside the house
4. Consent to
4.1. Install 3D-WDS in the house (intervention clusters only)
4.2. Use insecticide-treated nets (both intervention and control clusters) for a period of 12 months after the installation
4.3. Malaria screening for at least one child of the household

Participant type(s)
Mixed

Healthy volunteers allowed
No

Age group
Mixed

Sex
All

Key exclusion criteria
1. Community houses with fixed window panels, shutters, or well-constructed aluminium panels with glass windows
2. Houses without a sleeping space i.e., made for the purpose of cooking and dining or cattle shed
3. Buildings that are temporarily constructed or made with the purpose to serve as a community hall, recreational centre, mosque or church
4. Households with no children aged 6 months to 14 years
5. Children without informed consent
6. Children with health conditions that require frequent hospital or health centre visits

Date of first enrolment
01/10/2019

Date of final enrolment
31/05/2021

Locations

Countries of recruitment
Tanzania

Study participating centre
National Institute of Medical Research
Amani Research Centre

Muheza
Tanzania
PO Box 81

Sponsor information

Organisation
University of Helsinki

ROR
https://ror.org/040af2s02

Funder(s)

Funder type
Charity

Funder Name
Jane ja Aatos Erkon Säätiö

Alternative Name(s)
Jane and Aatos Erkko Foundation, Jane och Aatos Erkkos stiftelse, J&AE

Funding Body Type
Private sector organisation

Funding Body Subtype
Trusts, charities, foundations (both public and private)

Location
Finland

Funder Name
Helsingin Yliopisto

Alternative Name(s)
University of Helsinki, Helsingfors Universitet, Universitas Helsingiensis, HY, UH

Funding Body Type
Government organisation

Funding Body Subtype

Universities (academic only)

Location
Finland

Results and Publications

Individual participant data (IPD) sharing plan
The data-sharing plans for the current study are unknown and will be made available at a later date

IPD sharing plan summary
Data sharing statement to be made available at a later date

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Protocol article		04/06/2025	25/06/2025	Yes	No
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes