Comparing the risk of mosquito-borne infections in humans in irrigated and non-irrigated sites in Kenya

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Introduction

• More and more range lands in Africa are being converted to crop lands through irrigation to alleviate food insecurity

• These land use changes are mostly associated with:
  
  ➢ Increasing human population – traditional sources of food no longer adequate
  
  ➢ Climate change – decline in land productivity, reduction in rain-fed agriculture
Introduction

• Results: major trade-offs in ecosystem services

➤ More food produced (provisioning services) at the expense of biodiversity and regulatory services (disease, flooding, erosion)

➤ More effects of climate change – due to deforestation, use of fertilizers – hence, shift in vegetation communities, biome and biodiversity
Introduction

This study:

investigates whether the development of irrigation schemes in an arid and semi-arid area in Kenya increases the risk of mosquito-borne infections [Rift Valley fever, West Nile virus, Dengue fever]
Introduction

• Hypotheses

– The creation of permanent water masses through irrigation alters vector biodiversity and abundance, populations of livestock and humans at risk and the nature and frequency interactions between hosts and vectors.

– The occurrence of relatively intensive systems has impacts on health, wellbeing and economy that differ quantitatively and qualitatively from impacts in minimally altered ecosystems.

Pastoralists in the study site
Methodology

The study site:
Tana River and Garissa counties, northeastern Kenya

Study design
– Cross sectional surveys
– Power sample size estimation techniques – this suggested that we needed 220 households and 550 subjects
Methodology

Data collection

- Collation of secondary data from the local health centres
- Entomological surveys conducted using CDC miniature light traps
- Blood sampling – people above 5 years of age
- Laboratory screening of sera using ELISA
- Ethical approvals – African Medical Research Foundation (AMREF)
Results

Mosquitoes trapped – relative abundance and species distribution

(a) Results from surveys done when irrigation was active

(b) Results from surveys done at the inactive phase of irrigation
Results

Samples screened
- 481 samples have been screened so far
- Questionnaires administered to 430 households

Serological tests
- WNV and Dengue seroprevalence apparently higher than that for RVF though confirmatory are yet to be done

Relative seroprevalence of RVF, WNV and Dengue
Risk factor analysis

Model – 2 Logistic regression models

Outcomes
  – RVF
  – Combined WNV and Dengue outcomes

Predictors
  – Subject-level variables
  – Household-level variables
  – Area/village-level variables
Risk factor analysis - findings

For WNV and Dengue model

I. Males have a higher risk of exposure than females
II. Farmers have a higher risk compared to pastoralists

For RVF model

I. Males have a higher risk of exposure than females
Intervention points

- Create awareness among the local communities on infectious diseases associated with irrigation

- Build capacity on differential diagnosis of febrile illnesses in the local health centres. Currently, most cases are treated as:
  - Malaria
  - Brucellosis
  - Typhoid

Communities’ perceptions on diseases that manifest similar signs as malaria – limited knowledge on arboviruses
• Sensitize policymakers and health service providers to make health services more accessible to the locals – at present, less than 30% of the people utilize these services.

Ways in which the local communities respond to febrile illnesses such as malaria:
In conclusion

- Arboviral infections are common
- Different risk factors, such as age and occupation, are important
- Need capacity building
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