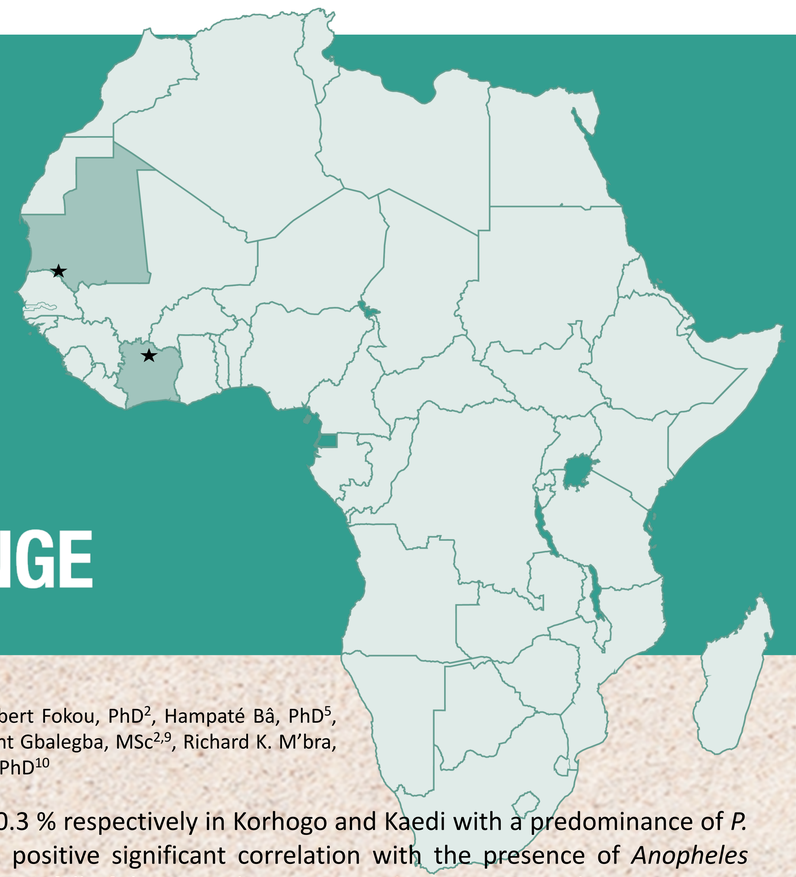
VULNERABILITY AND RESILIENCE TO MALARIA AND SCHISTOSOMIASIS IN THE NORTHERN AND SOUTHERN FRINGES OF THE SAHELIAN BELT IN THE CONTEXT OF CLIMATE CHANGE



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ABSTRACT

Ecohealth methodology was implemented in two cities of the Sahel belt to understand the complexity of hazards, vulnerabilities and exposures to malaria and schistosomiasis and identify sustainable solutions for resilience. In each city, two cross-sectional surveys were done in dry and rainy seasons.

In Korhogo (Côte d'Ivoire), intestinal schistosomiasis is predominant (4.6%) while urinary forms predominate in Kaedi (4%) and are statistically higher in the dry season ($\chi2=5.64$; $p=0.017$)

Malaria prevalence was 12.5 % and 0.3 % respectively in Korhogo and Kaedi with a predominance of *P. falciparum*. Dissolved oxygen has a positive significant correlation with the presence of *Anopheles gambiae* larvae (OR=1.20; p=0.029). Rainfall of the preceding two month was associated to an increase of malaria incidence of 0.9% to 1%. The most important assets of communities to face the diseases are the individual and social capitals. Preliminary results are proving usefulness of Ecohealth that could be a spearhead for sustainable adaptation of malaria and schistosomiasis-affected communities to climate change and/or variability.

AIMS AND OBJECTIVES

Aims

Study the relationship between meteorological variables, socio-economic, environmental, and socio-sanitary vulnerability factors and the transmission of malaria and schistosomiasis in order to develop appropriate strategies and tools for resilience.

Objectives

1-Describe the morbidity due to malaria and schistosomiasis as well as their socio-economic determinants, environmental determinants (distribution and characteristics of breeding sites, of snail habitats and human-water contact points) and socio-sanitary determinants (access to water, hygiene and sanitation, other disease prevalence) in the context of climate change.

2-Analyze the relationship between socio-ecological and climatic systems and the transmission of malaria and schistosomiasis.

3-Develop adapted tools and strategies of resilience to malaria and schistosomiasis taking into accounts the current and future effects of climate change.

METHODOLOGY

A cross sectional study was conducted in Korhogo and Kaedi respectively in the rainy season (July 2014 in Korhogo and August 2014 in Kaedi) and dry season (April 2015 in Korhogo and May 2015 in Kaedi).

During each season, we:

1. Collected historical clinical data (2005-2014) and meteorological data (1973-2014) among health care facilities and national meteorological agencies
2. Collected geographical and environmental data using GPS (Global Positioning System) for the localization of environmental risk factors (breeding site, wastes disposals, water points and their characteristics)
3. Conducted cross-sectional surveys by questionnaire in each city, followed by parasitological (urine, blood, feces) surveys at household level and environmental (entomological, malacological, water quality) surveys
4. Conducted socio-anthropological surveys (Participatory photography, Focus Group Discussion, Semi-Structured Interviews
5. Conducted a Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis of the health sectors

All data were analyzed using different software (STATA 14, MAXQDA, ARCGIS)

Photo 1: Feces analysis

Photo 2: Foto-voice discussion

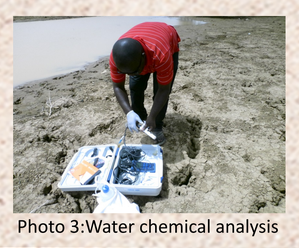

Photo 3:Water chemical analysis

Photo 4: RDT for malaria

RESULTS

Kaedi

- ✓ Prevalence of urinary schistosomiasis was 4% (86/2162) and statistically higher in the dry season ($\chi2=5.64$, $p = 0.017$). Boys (58.2%) were slightly more infected than girls (41.8%) ($p = 0.14$).
- ✓ 311 snails belonging *Bulinus truncatus, B. senegalensis* (53.7% for both) and *B. forskalii* (46.3%) were collected in the Senegal river.
- ✓ Overall *Plasmodium* prevalence was 0.3 % (26/8159). Among the 26 positive thick film, 16 (62%) were *P. falciparum.* Overall 4 *adult and 4 larvae of An. gambiae s.l.* were collected.

Korhogo

- ✓ Urinary schistosomiasis prevalence was 0.5%(6/1125) and 0.3%(4/1248) in the rainy season and dry respectively, against 6%(60/1009) and 3.5%(42/1202) for intestinal schistosomiasis.
- ✓ 442 snails belonging to *Bulinus truncatus* (23%), *B. forskalii (*51.35%) and *Biomphalaria pfeifferi (*25.56%) were collected mainly in the dam.
- ✓ Overall *Plasmodium* prevalence was 12.5 %(863/6868).
- ✓ Among the 863 positive thick film, 857 (99.3%) were *P. falciparum.* Overall 306 female of *An. gambiae s.l.* were caught.
- ✓ The average rate of aggressiveness was 0.46 bite/man/night.
- ✓ The sporozoite index was 0.024 (5/207) and the annual EIR was 3.65 infective bites per person.
- ✓ Each 1cm increment in rainfall during the previous month and the two months before were on average associated with a 0.9 % (95%-CI: 0.3 to 1.5%) and a 1.0% (95%-CI: 0.4% to 1.6%) increase in malaria incidence respectively. Schistosomiasis is positively associated with the temperature of two month before ($r=0.68$; $p=0.016$).

The two cities

- ✓ There is a good overlap between the spatial and temporal distribution of risk factors (surface water, stagnant wastewater points) and households with malaria cases in Korhogo and Kaedi.
- ✓ It appears that people practiced a care syncretism in the case of malaria while for schistosomiasis, they mainly use local traditional strategies. That means people rely basically on individual resources. Social resources are also mobilized through family and neighborhood networks for health assistance.
- ✓ Support from official and non-official structures does not appear to be a major asset for resilience.

CONCLUSIONS

- ✓ The dam of Korhogo and the Senegal River in Kaedi are important factors for the transmission of schistosomiasis.
- ✓ The snail density varies from one season to another.
- ✓ Resting places, healthcare financial access, and socioeconomic status are important indicators associated to malaria transmission.
- ✓ Meteorological factors are associated to both diseases.
- ✓ To fight against both diseases, people mainly use local traditional strategies. Individual resources and social resources are mobilized to face the diseases.
- ✓ Support from institutional level does not appear to be a major asset for resilience.

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