Trends in Malaria Epidemiological Factors Following the Implementation of Current Control Strategies in Dangassa, Mali

Mahamoudou Toure (✉ mah.toure@gmail.com)

University of Bamako <https://orcid.org/0000-0001-6238-5063>

Moussa Keita

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

Fousseyni Kane

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

Daouda Sanogo

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

Salim Kante

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

Drissa Konate

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

Ayouba Diarra

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

Nafomon Sogoba

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

Mamadou B Coulibaly

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

Sekou F Traore

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

Mahamadou Diakite

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

Jeffrey G. Shaffer

Tulane University School of Medicine

Donald J Krogstad

Tulane University School of Medicine

Seydou O. Doumbia

USTTB FMOS: Universite des Sciences des Techniques et des Technologies de Bamako Faculte de Medecine et d'Odontostomatologie

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Abstract

Background: Over the past decade, three strategies have reduced severe malaria cases and deaths in endemic regions of Africa, Asia, and the Americas, specifically: 1] artemisinin-based combination therapies (ACTs), 2] insecticide-treated bed nets (ITNs) , and 3] intermittent preventive treatment with sulfadoxine-pyrimethamine in pregnancy (IPTp. The rationale for this study was to examine communities in Dangassa, Mali where in 2015 two additional control strategies were implemented: ITN universal coverage and Seasonal Malaria Chemoprevention (SMC) among children less than five years.

Methods: This was a prospective study based on a rolling longitudinal cohort of 1,401 subjects participating in biannual smear surveys for the prevalence of asymptomatic *P. falciparum* infection and continuous surveillance for the incidence of human disease (uncomplicated malaria). Entomologic collections were performed to examine the intensity of transmission based on pyrethroid spray catches, human landing catches, and enzyme-linked immunosorbent assay (ELISA) testing for circumsporozoite antigen.

Results: A total of 1,401 participants of all ages were enrolled in the study in 2012 after random sampling of households from the community census list. Prevalence of infection was extremely high in Dangassa varying from 9.5% to 62.8% at the start of the rainy season and from 15.1% to 66.7% at the end of the rainy season. Likewise, the number of vectors per house, biting rates, sporozoites rates and entomologic inoculation rates (EIR) were substantially greater in Dangassa.

Discussion: The findings for this study are consistent with the progressive implementation of effective malaria control strategies in Dangassa. At baseline (2012-2014), prevalence of *P. falciparum* was above 60% followed by a significant year-to-year decrease starting in 2015. Incidence of uncomplicated infected was greater among children < five years while asymptomatic infection was more frequent among the five to fourteen years old. A significant decrease in entomological inoculation rate was also observed from 2015 to 2020. Likewise, vectors' density, sporozoites rates, and entomologic inoculation rates decrease substantially during the study period.

Conclusion: Efficient Implementation of two main malaria prevention strategies in Dangassa substantially contribute to a reduction of both asymptomatic and symptomatic malaria in Dangassa from 2015 to 2020

Full Text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the latest manuscript can be downloaded and [accessed as a PDF](#).

Tables

Table 1: Sociodemographic description of the study population

Characteristic	Screening & Enrollment 2012
	N = 1,401
Sex	
Male	642 (46%)
Female	759 (54%)
Median Age (min, max)	11 (0, 86)
Age groups	
<5 years	249 (18%)
5-9 years	273 (19%)
10-14 years	258 (18%)
15-20 years	156 (11%)
>20 years	465 (34%)

Figures

Figure 1

Timeline of the implementation of ongoing malaria control strategies in Dangassa over the study period 2013 - 2020 Source: Mali NMPC: National Malaria Control Program (Not published)

Figure 2

Map of the study site Note: The designations employed and the presentation of the material on this map do not imply the expression of any opinion whatsoever on the part of Research Square concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. This map has been provided by the authors.

Figure 3

Overall seasonal variations of *P. falciparum* infection prevalence at the start and end of malaria transmission from 2012 to 2016:

Figure 4

Age-specific *P. falciparum* malaria infection at the start and the end of the malaria transmission season from 2013 to 2020

Figure 5

Overall seasonal variations of malaria monthly incidence rate from 2013 to 2020

Figure 6

Mean monthly variation of malaria incidence rates per 1,000 person-weeks in Dangassa from 2013 to 2020

Figure 7

Age-specific mean of malaria incidence rate from 2013 to 2020 Average incidence rate is estimated for each group. Each dot represents the yearly incidence rate per month. The lateral bar represents average incidence rate variation per month for each age group during. One-way ANOVA by Tukey's multiple comparison test with a significance rate of 5% was used to compare the difference observed between means.

Figure 8

Monthly mean density (MMD) and human blood index (HBI) of *An. gambiae* s.l. in human dwellings in Dangassa

Figure 9

Anopheles gambiae s.l. monthly biting rates and Entomological Inoculation Rate (EIR) variation of malaria transmission from 2012 to 2019 MHBR: Mean Human Biting Rate EIR: Entomological Inoculation Rate

Supplementary Files

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