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Rwanda Malaria Control Efforts Coordination

Addressing drug resistance in Rwanda

11th RBM CM Working Group Annual Meeting
Venue: Lemigo Hotel, Kigali Rwanda

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Rwanda at a glance…

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- **Population at Risk of Malaria:** 12,955,736 i.e., all persons are at risk
- **Principal Malaria Parasites:** *Plasmodium falciparum* (85 percent), *P. malariae* (10-11 percent), *P. ovale* (3-4 percent). *(secondary analysis dataset MIS 2017)*
- **Principal Malaria Vectors:** *Anopheles gambiae* s.l. is the primary vector (71.7%). Other vectors include *An. pharoensis* and *An. ziemanni* (18.2%)(*Annual report Malaria 2020-2021)*
- **Malaria Case Incidence per 1000 Population:** 114 per 1,000 population (41% Reduction of in Malaria Incidence from 2019/2020 to 2020/2021.(*Rwanda Malaria and Neglected Tropical Diseases Annual Report 2020-2021*)
- **Under-Five malaria prevalence**: 1% *(Demographic and Health Survey 19-20)*
- **Under-Five Mortality Rate:** 45 per 1,000 live births (*Demographic and Health Survey 19-20*)

Key National Malaria Control Interventions Revised MSP 2020-2024

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1. Malaria Prevention using insecticide treated nets(ITNs)
2. Indoor Residual Spraying (IRS)
3. Malaria Case Management (at home or in clinics)
4. Social Behavior Change Communication (education,…)
5. Other Tools(larviciding …..)

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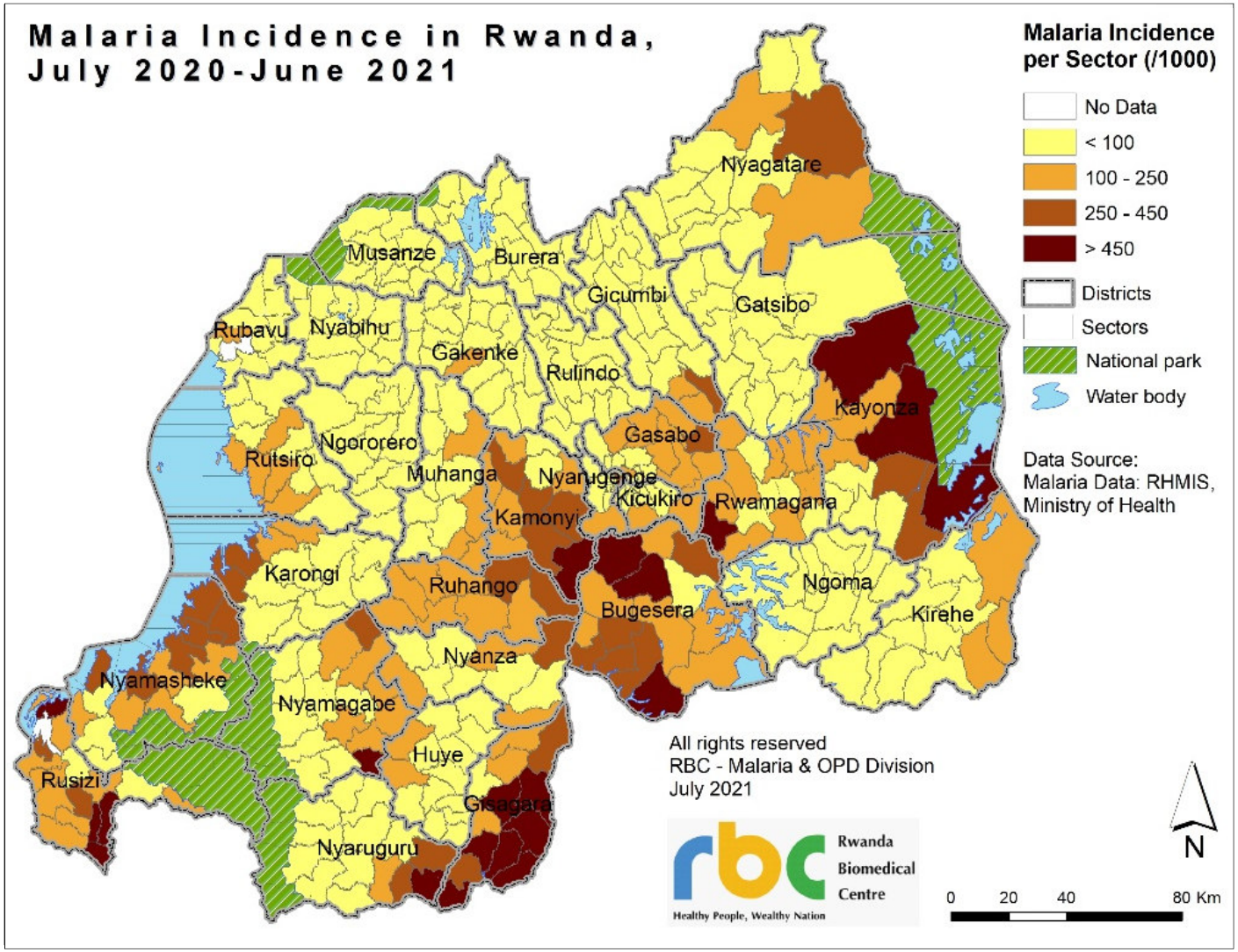

Incidence per District

- Almost 3 Provinces (N,E,W) and CoK below 100 per 1000
- Gisagara District not responding

Incidence per Sector

- Hotspot Sectors
- More than IRS needed
- Do we have data at cell/village level

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Antimalarial drugs Monitoring History in Rwanda

ACT clinical efficacy studies conducted in Rwanda

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Year	Sites	Treatment arms	PCR-Corrected ACPR	K13 mutations reported
2004-2005	Mashesha and Rukara	AL, AQ+SP	96.68%	Not done
2007-2009[1]	Rukara, Mashesha	DHA-PQ, AL, chlorproguanil-dapsone-artesunate (CD+A)	>90%	Not done
2012-2015[2]	Rukara, Kibilizi, Bugarama, Nyarurema	AL,	>90%	Yes
2012-2015[2]	Masaka,Ruhuha	AL, DHA-PQ	>90%	Yes
2018[3]	Masaka, Rukara Bugarama	AL	>90%	Yes

1: The Four Artemisinin-Based Combinations (4ABC) Study Grou- A Head-to-Head Comparison of Four Artemisinin-Based Combinations for Treating Uncomplicated Malaria in African Children: A Randomized Trial. PLoS Med. 2011 Nov; 8(11): e1001119.

2. Uwimana et al. 2019. Efficacy of artemether–lumefantrine versus dihydroartemisinin–piperaquine for the treatment of uncomplicated malaria among children in Rwanda: an open-label, randomized controlled trial. Transactions of The Royal Society of Tropical Medicine and Hygiene, Volume 113, Issue 6: 312–319

3. Uwimana et al. 2021. Association of Plasmodium falciparum kelch13 R561H genotypes ith delayed parasite clearance in Rwanda: an open-label, single-arm, multicentre, therapeutic efficacy study. The Lancet Infectious Diseases. https://doi.org/10.1016/S1473-3099(21)00142-0

Reported prevalence of *kelch13* 561H in Rwanda

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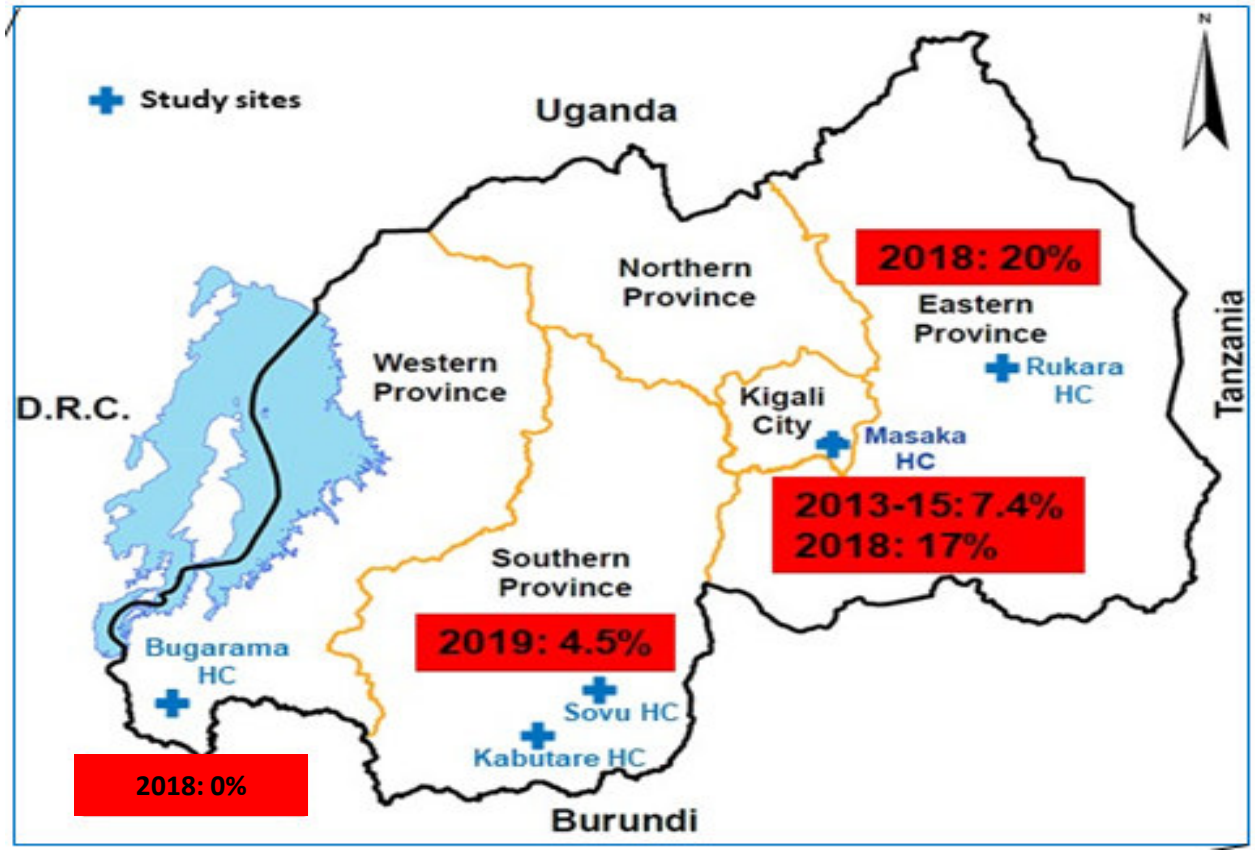

- Uwimana et al. (2021). Association of Plasmodium falciparum kelch13 R561H genotypes with delayed parasite clearance in Rwanda: an open-label, single-arm, multicentre, therapeutic efficacy study. The Lancet Infectious Diseases. https://doi.org/10.1016/S1473-3099(21)00142-0
- Bergmann et al. Increase in Kelch 13 Polymorphisms in Plasmodium falciparum, Southern Rwanda. Emerging infectious

Reported low prevalence of candidate *kelch13* mutations

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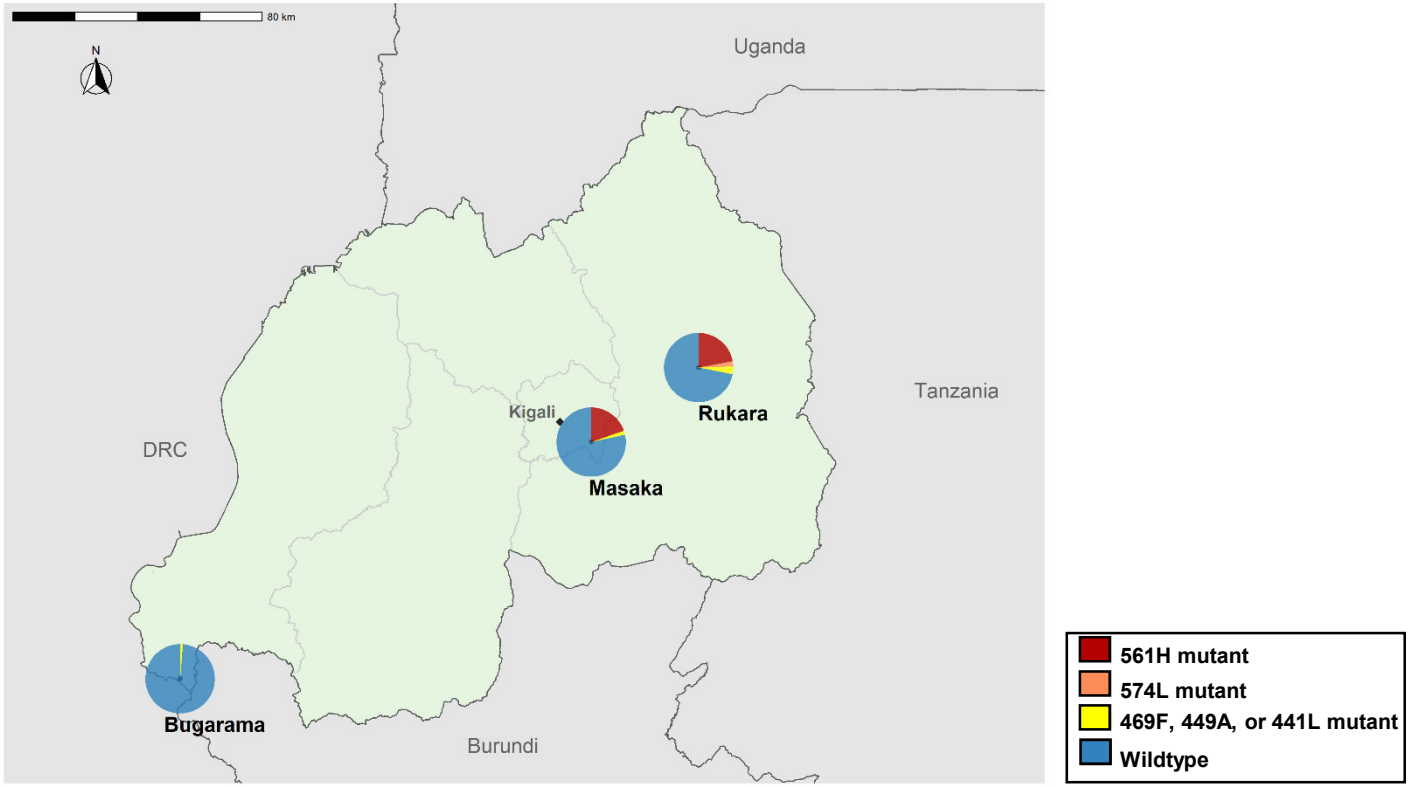

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Prevalence of day 3 parasitemia and R561H mutation in pre-treatment isolates

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	Day 3 parasitemia positive		Day 3 parasitemia negative	
Study site (n)	561H n, (%)	R561 n, (%)	561H n, (%)	R561 n, (%)
Rukara (82)	5 (6·1)	7 (8.5)	13 (15.9)	57 (69.5)
Masaka (51)	6 (11·8)	2 (3.9)	4 (7.8)	39 (76.5)
Bugarama (85)	0 (0)	0 (0)	0 (0)	85 (100)

Uwimana et al. (2021). Association of Plasmodium falciparum kelch13 R561H genotypes with delayed parasite clearance in Rwanda: an open-label, single-arm, multicentre, therapeutic efficacy study. The Lancet Infectious Diseases. https://doi.org/10.1016/S1473-3099(21)00142-0

What now…

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Efficacy of AL remains high in Rwanda despite the presence of *kelch13* mutations and delayed parasite clearance, however, continued monitoring required !

- **Sustaining the current working interventions**

- Ongoing TES: 2021-2022 (AL and DHA-PQ)

Enhanced to include:

  - Determination of parasite clearance rate
  - *In vitro* drug sensitivity assays
  - Assess molecular markers of resistance
  - Measure lumefantrine levels at day 7

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Efficacy of AL remains high in Rwanda despite the presence of *kelch13* mutations and delayed parasite clearance, however, continued monitoring required !

- Plans to test new ACTs: pyronaridine-artesunate (Pyramax)
- Introduction of gametocide antimalarial drugs: single low-dose primaquine
- Consideration of multi-first line treatments is ongoing