

Implementation of artesunate rectal capsules as a pre-referral intervention for severe malaria patients at community level in eight regions in Madagascar: a process evaluation



UNIVERSITÉ DE FIANARANTSOA

MMV 
Medicines for Malaria Venture

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Acronyms and abbreviations

ACT	Artemisinin-based Combination Therapy
ARC	Artesunate Rectal Capsule
CHRD	District Referral Hospital (Centre Hospitalier de Référence de District)
CHRR	Regional Referral Hospital (Centre Hospitalier de Référence de Région)
CHW	Community-based Health Worker
CSB	Basic Health Centre (Centre de Santé de Base)
DRSP	Regional Public Health Directorate (Direction Régionale de la Santé Publique)
EMAD	District Management Team (Équipe de Management de District)
EMAR	Regional Management Team (Équipe de Management de Région)
EPI	Expanded Programme on Immunization
HCP	HealthCare Provider
IEC	Information Education Communication
IMCI	Integrated Management of Childhood Illness
IPT	Intermittent Preventive Treatment
IRS	Indoor Residual Spraying
KAP	Knowledge, Attitudes and Practices
MAR	Monthly Activity Report
MMV	Medicines for Malaria Venture
NMCP	National Malaria Control Programme
RDT	Rapid Diagnostic Test
SD	Standard Deviation
SDSP	District Public Health Service (Service du District de Santé Publique)
TFP	Technical and Financial Partners
USAID	U.S. Agency for International Development
WHO	World Health Organization

1. Background and rationale

According to the WHO, an estimated 229 million malaria cases and 409 000 malaria deaths were recorded worldwide in 2019. The African region accounted for most of these deaths (94%), with 67% occurring in children under 5. The WHO's eleventh World Malaria Report confirmed that the two crucial objectives of the Global Technical Strategy for Malaria 2016-2030, i.e. to reduce malaria cases and deaths by at least 40% by 2020, will not be achieved (1).

The WHO reported a 20% rise in the number of malaria cases in 2018 in 20 African countries, including Madagascar (1).

Madagascar reported an increase in cases of 38.1% during the period 2015-2019. The prevalence of malaria in Madagascar increased from 471 599 cases in 2016 to 961 829 cases in 2018 (2). In 2018, 37 489 severe malaria cases were reported in Basic Health Centres (CSBs), and 14 582 in hospital centres. The number of deaths increased in line with the number of cases, which doubled in three years.

If left untreated, severe malaria's mortality rate is almost 100% (3). However, with prompt and effective antimalarial treatment and supportive care, the mortality rate drops to 10-20%. Several factors are involved in the delayed treatment of severe malaria. The delay in leaving the village for a health facility varies from zero to seven days (4). A study conducted in Guinea-Bissau showed that the average waiting period was 2.13 ± 1.58 days (mean \pm SD). The most common reason given for such delays was the need to find money to pay for consultations and drugs (83% of respondents), followed by the need to find money for transport (61% of respondents) or a means of transport (25% of respondents). Other reasons mentioned included waiting for the family decision-maker or for the opportunity to leave. Some mothers mentioned the need for a spiritual ceremony prior to leaving for a health facility. In Tanzania, some mothers think that seizures and a high fever are associated with evil spirits (5), and therefore that these evil spirits must be chased away before resorting to other remedies. This explains why they initially turn to traditional healers for seizures cases. Certain countries, such as Tanzania, adopted a strategy of cooperation with traditional healers regarding the referral of patients to health facilities. Given that malaria management is free, one of the causes of this delay is the remoteness of some areas. For instance in Madagascar between 2015 in 2017, only approximately 40% of communes were accessible by roads all year round (6).



1.1. Implementation of pre-referral management with ARC

Given this context, in 2012 Madagascar decided to use artesunate rectal capsule (ARC) at the community level as a pre-referral intervention to reduce the mortality rate of severe malaria. The intervention has two components:

- Administration of ARC by Community Health Workers (CHWs) as a pre-referral intervention;
- Follow-up of the patient's transfer to a health facility where a complete treatment for severe malaria will be administered.

The safe and effective implementation of ARC in peripheral healthcare facilities is dependent on conditions such as:

- Well-trained CHWs able to identify severe malaria danger signs (severe febrile illness) and to administer ARC;
- Availability of ARC for the pre-referral management of a severe febrile illness at community level;
- Awareness among caregivers and the community at large of malaria danger signs and of the importance of prompt pre-referral intervention.

Healthcare facilities must have:

- A reliable system to transfer patients to a higher-level healthcare facility, where the malaria diagnosis will be confirmed, and where personnel trained in severe malaria management will administer artesunate intravenously. Failing that, the best alternative recommended in the WHO's treatment guidelines will be applied;
- Drugs for the treatment of severe malaria;
- Effective procurement and supply management systems;
- Effective and comprehensive monitoring, evaluation and supervision.

During the 2015 ARC implementation, the CHWs were given training sessions, but in those days there were no visual aids and guides to explain the use of ARC.

Since WHO-prequalified artesunate rectal capsule 100 mg became available in Madagascar only in January 2019, cascade training and printable materials for community actors have been provided with the financial support of MMV. Community healthcare providers needed re-motivating with on-site refresher training on the use of artesunate rectal capsule. The aim of this interventional programme was to introduce the use of ARC in Madagascar, using a picture box, a checklist, a 4-page brochure and a poster raising awareness on pre-referral artesunate rectal capsule in children under 6 years old.

The central team provided cascade training and refresher training meetings for the regional and districts teams, which in turn trained CSB personnel during the monthly review.

Table 1: Description of cascade training

Level	Planned		
	Trainer	Participants	Trained
Region - District	80	80	80
CSB	46	542	542
Community health worker	542	7212	7212

As part of the implementation's monitoring and evaluation, a study of the actors implementing the ARC programme was carried out.

The purpose of this study was to document the implementation of the ARC programme based on the participants' experience of the training and teaching tools developed for this purpose.

1.2. Objectives of the evaluation

1.2.1 General objective

The general objective of the study was to assess the setting up of a cascade training on the use of ARC at the community level, including the evaluation of resources (inputs), activities conducted (i.e. training sessions) and the short-term impact, as well as the implementation of the use of artesunate rectal capsule at community level, to inform the NMCP's preparations for a nationwide scaling up of the intervention. The results of the study will also be shared with countries considering a similar intervention.

1.2.2 Specific objectives

- ⦿ Analyse participants' experience of the pre-referral strategy implementation;
- ⦿ Evaluate, in the short term, the knowledge, attitudes and practices of CHWs on the use of ARC;
- ⦿ Evaluate, in the short term, the knowledge, attitudes and practices of parents regarding severe malaria and their perception of ARC;
- ⦿ Evaluate the availability of inputs at every level of the health system, and the supply mechanisms (from district to community level);
- ⦿ Identify the facilitating factors and obstacles affecting the programme's implementation;
- ⦿ Evaluate the training materials and communication tools used.

2. Methodology

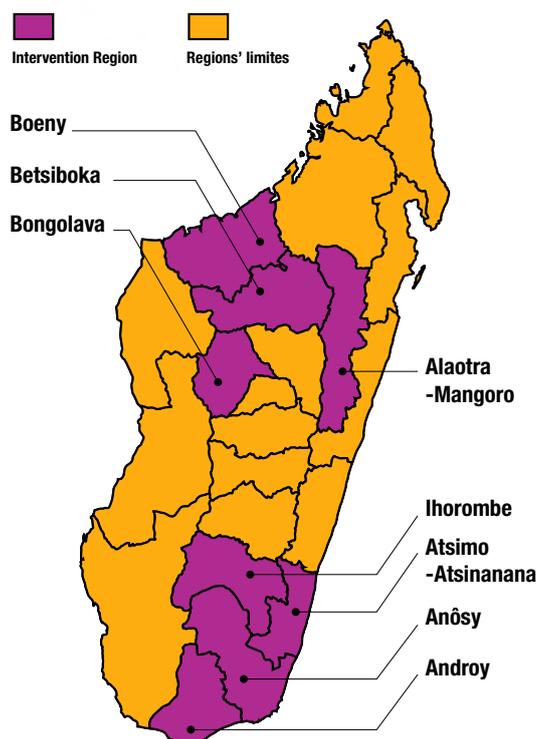
2.1. Purpose

The objective was to determine whether the activity was carried out correctly, using the three IEC documents and the distributed communication tools.

2.2. Study location

Madagascar is divided into 22 regions and 114 health districts. To implement the use of artesunate rectal capsule at community level, the Public Health Ministry entered into various partnerships, including with MMV. MMV was in charge of the programme in 8 of the 22 regions: Anosy, Androy, Betsiboka, Ihorombe, Bongolava, Atsimo Atsinanana, Alaotra Mangoro and Boeny. These 8 regions include 30 districts, with 12 378 CHWs attached to 613 basic health centres (CSBs), i.e. approximately one third of all CHWs in the country.

Figure 1: MMV intervention region



2.3. Type of study

This is a cross-sectional survey of a representative sample recruited in the selected regions. The survey was aimed mainly at representatives of the Regional Directorate, Public Health District Services, public health centres, CHWs, and those in charge of the distribution of ARC.

To assess the effects of the interventions, the following approaches were adopted:

- ⦿ **Study A:** Collection and analysis of existing data from health centres, as well as from the district, regional and national bodies involved in the activities carried out.
- ⦿ **Study B:** Two-pronged KAP survey targeting healthcare providers (CHWs, CSB Heads, central level) as well as the population, to assess care-seeking behaviour and perception of ARC.

2.3.1 Study A: Collection of data on activities carried out

The study was designed to observe and analyse the activities carried out: (i) identify discrepancies between what was planned and what happened; (ii) determine the quality and acceptability of the intervention; (iii) measure its distribution and coverage; and finally (iii), determine the positive or negative influence of contextual factors on the intervention. The results will be used to scale up or expand the interventions and activities to other localities.

- ⦿ Type of study: retrospective study
- ⦿ Data source: technical and financial reports on the interventions carried out, including training, adjustment activities, reproduction and dissemination of materials, and KAP survey of health providers and the population.
- ⦿ Data collection method: compilation of all reports on training, awareness-raising, activities carried out according to the logic model, individual interviews and focus groups.
- ⦿ Methodology: quantitative and qualitative surveys
- ⦿ A follow-up of the resources was also carried out on:
 - ⦿ Cascade training
 - ⦿ Adjustment and reproduction of materials
 - ⦿ Dissemination

According to the study's conceptual framework, several training parameters were identified and analysed.

- ⦿ Fidelity: what happened compared to what was planned
- ⦿ Dose: e.g. amount of training
- ⦿ Reach: number of people exposed to the intervention / training
- ⦿ Acceptability
- ⦿ Feasibility of the programme
 - Type of sampling: all activity reports were collected comprehensively at all levels (DRSP, SDSP and CSB).

Figure 2: Logic model

Programme rationale	Public health needs in Madagascar. Malaria is transmitted throughout the country: 100% of the population was at risk in 2017				
	Problem: Artesunate rectal capsule will be implemented in multiple regions this year. The last training was conducted 3 years ago, and knowledge has not been updated since to support implementation.				
Theory	Deliver training and easy-to-use tools to improve the population's capacity and knowledge regarding severe malaria and its acceptance of ARC, and patient referral				
Path to change	Inputs	Activities	Short-term results	Medium-term results	Long-term results
	<ul style="list-style-type: none"> Human resources Financial resources Tools 	<ul style="list-style-type: none"> Adjustment of tools dissemination of tools at community level 	<ul style="list-style-type: none"> Change in learning Strengthening of CHWs capacities Community involvement Availability of ARC 	<ul style="list-style-type: none"> Change in action Improvement of population access and involvement in severe malaria Improved acceptance of patient referral 	<ul style="list-style-type: none"> Change in disease management Reduced severe malaria morbidity and mortality Improved public health
Main risks	Insufficient funding	Lack of stocks at regional and district levels	Turnover of healthcare providers/ Poor knowledge	Lack of community involvement	No government support

The evaluation of this process will help determine the impact of the intervention's implementation (inputs, activities, short-term outcomes) and identify the factors/ mechanisms that influence the theory of change.



Table 2: Evaluation of the ARC programme

Components	Questions	Indicators	Methods
Background	<ul style="list-style-type: none"> Is there a policy of pre-referral of severe malaria cases in the country? Is the patient referral system operational in each locality? 	<ul style="list-style-type: none"> Availability of a strategic plan for the management of severe malaria 	<ul style="list-style-type: none"> Identification of source documents Evaluation of documents defining the design and implementation of practical activities Consultations with the implementation team at central and peripheral levels
Reach	<ul style="list-style-type: none"> How can the knowledge, attitudes and practices of healthcare providers and CHWs on policy implementation be improved? How can the population's acceptance and adhesion be optimised to improve understanding of the intervention? What information does the NMCP need to scale up this strategy? 	<ul style="list-style-type: none"> Percentage of training activity carried out with providers Percentage of awareness-raising activities implemented Number of changes made during the programme's implementation to guarantee effective reach 	<ul style="list-style-type: none"> Review of training activity reports and MARs Consultation of the implementation document
Dose delivered	<ul style="list-style-type: none"> Are human resources qualified to operate the systems? Are inputs and management tools adequate and available at each healthcare level? Are stakeholders and the population aware of pre-referral management? What are the factors limiting the dose delivered? 	<ul style="list-style-type: none"> Percentage of healthcare providers and CHWs trained to perform pre-referral management activities Percentage of health facilities or community sites reporting input shortages Percentage of health facilities or community sites reporting management tool shortages Percentage of healthcare providers and targeted members of the public who reported having seen or heard awareness-raising messages on pre-referral treatment 	<ul style="list-style-type: none"> Review of training activity reports and MARs Analysis of interview results
Dose received	<ul style="list-style-type: none"> What is the frequency of the doses received by stakeholders and beneficiaries? What parts of the intervention were not received in a coherent manner? Why? What was the difference between the evaluation's expected results and each activity delivered? 	<ul style="list-style-type: none"> Percentage of healthcare providers and CHWs having enough knowledge to carry out the pre-referral management activities Percentage of health facilities and community sites applying the strategy Percentage of severe malaria cases that benefitted from the pre-referral protocol Percentage of the population supporting the strategy Determination of stakeholders' and beneficiaries' perception regarding the strategy 	<ul style="list-style-type: none"> Analysis of the interview results
Fidelity	<ul style="list-style-type: none"> Was the programme implementation provided with fidelity and quality? Were the programme interventions implemented as planned? Have some of the programme interventions not worked? How did the programme use evidence and comments on what did not work to learn and adapt the activity's implementation? 	<ul style="list-style-type: none"> Measure of the difference between theoretical propositions and practical applications, and its determinants 	<ul style="list-style-type: none"> Analysis of the results generated by the study data

2.3.2 Study B: KAP survey of healthcare providers and the population

- The qualitative aspect included observations, individual interviews and inventories (e.g. within health facilities, community facilities, etc.) to identify the facilitating factors and obstacles affecting the programme's implementation at each level of the health system and among the population;
- The quantitative aspect was designed to ensure that the answers were representative, particularly in surveys of healthcare providers and the population.

2.3.2.1 Specific objectives of the KAP survey

- Evaluate the knowledge, attitudes and practices of healthcare providers on the use of ARC;
- Evaluate the availability of inputs and support at health facilities and community sites, as well as the supply mechanism;
- Identify the determinants of problems encountered which may affect the programme's implementation.

2.3.2.2 Target population

Targeted individuals included District Management Team (EMAD) personnel, CSB Heads, CHWs and parents of children under 5 years old.

- Inclusion criteria for the qualitative approach
 - EMAD personnel that participated in the training on ARC;
 - CSB Heads trained on ARC and who then trained CHWs in their respective areas of responsibility;
 - CHWs who received training on ARC from CSB Heads;
 - Parents of children under 5 living in an area where CHWs had been trained on ARC.
- Study's exclusion criteria
 - Individuals who did not agree to participate;
 - Individuals unable to answer the questions for whatever reason (hearing impairment, language deficiency, mental handicap, etc..).

2.3.2.3 Sampling and sample size

The study's quantitative and qualitative components were carried out in the 8 areas of ARC strategy implementation financed by MMV.

In view of the resources available and the planned duration of the study, a sample of 13 districts out of the 28 registered was randomly selected for the survey.

For the quantitative component, in order to estimate the knowledge, attitudes and practices of the study population with regard to the ARC strategy, a sample of 31 regional and district managers, 83 healthcare providers involved in health training, 171 CHWs and 594 mothers or fathers of children under 5 was selected. This sample complied with the number of participants required for a cross-sectional study with a power of 80% at the significance level of 0.05% ($p=0.05$).

For the qualitative component, participants were selected on a reasoned assumption that they were in possession of the necessary information to achieve the set objectives.

The size of the sample should a priori be conditioned by the saturation of the collected data. However, for organisational and logistical reasons, the number of people to be interviewed was hypothetically fixed beforehand. Furthermore, the possibility of making changes in the field based on the saturation of data collection had already been considered. Thus, at the beginning, the number was set at 130 individuals, but by the end, after adding 2 people from the Regional Management Team (EMAR) and 15 CSB Heads, the total study population was 147.

2.3.2.4 Data collection and analysis

For the quantitative component, an electronic standardised questionnaire was used to collect the data on a tablet. It should be noted that, even if some respondents did not answer one or more questions voluntarily, they were still included in the data analysis. The indicators selected according to the stated objectives were analysed with the Stata software.

For the qualitative part, data was collected through semi-structured individual interviews of healthcare providers and parents, and group interviews of CHWs.

Each interview was conducted by 2 people: a moderator and a secretary.

Specific interview guides for each category of respondent were used (District Management Team - CSB Heads - Community healthcare providers - Mothers/Fathers of children). These guides, which served primarily as a checklist for the interviewers, addressed several questions grouped under different themes. The themes depended on the category of respondents:

- District Management Team: malaria control in Madagascar and the ARC programme (including training on ARC);
- CSB Heads: malaria control in Madagascar, its management at community level and the ARC programme;
- CHWs: malaria control, malaria, and the ARC programme;
- Parents: care seeking and use in case of illness, use of CHWs and health facilities, malaria, perception of the different drug administration routes, and perception of the services provided by CHWs and health facilities.

All interviews were fully recorded on a dictaphone with the respondent's consent.

The table below summarises the number of interviews performed by interviewee category and by interview type (individual interview or focus group):

Table 3: Number of interviews performed by interview type and by category of respondent

Categories	Individual interview	Focus group
EMAR personnel	2	0
EMAD personnel	13	0
CSB Heads	16	1
Community Health Workers (CHWs)	0	13
Fathers of children	13	0
Mothers of children	13	0
Total	57	14

2.3.2.5 Quantitative data treatment and analysis

The analysis plan included a descriptive analysis of the study population and an analysis of all the qualitative variables using a Chi² test. The significance level was set at 0.05.

2.3.2.6 Qualitative data treatment and analysis

All the interviews were transcribed into Malagasy and translated into French by the person who conducted them.

The interviews were coded using the NVivo software. A list of codes and themes was drawn up and the different parts of the interviews were broken down and linked to the appropriate codes. A rather inductive approach was thus used. Subsequently, the different themes were analysed according to the principles of cross-cutting thematic analysis.

Three analysis grids were used based on the category of interviewees:

- ⦿ EMAD personnel, CSB Heads and EMAR;
- ⦿ CHWs;
- ⦿ Parents.

2.4. Ethical considerations

The study protocol was approved by the Biomedical Research Ethics Committee of the Public Health Ministry, Madagascar N°095 MSANP/SG/AGMED/CERBM.



3. Results

3.1. Healthcare providers at district and regional levels (EMAR/EMAD)

The majority of interviewed healthcare providers at district and regional levels (96.77%) confirmed the existence of: (i) a policy for severe malaria management; (ii) strategies adopted for pre-referral intervention at the community level; and (iii) attached health facilities.

Despite the existence of the referral system, the frequency of its use decreased from the CSB level onwards. The system was declared functional by 74.19% of the healthcare providers.

The majority of healthcare providers at district and regional levels (90%) and at CSB level (73.91%) mentioned that the number of training sessions conducted was equal to the number planned. At the regional and health district levels, 22 healthcare providers (96.43%) confirmed the pre-referral use of ARC in children under 5.

3.1.1 Characteristics of district and regional level healthcare providers

A total of 31 healthcare providers at district and regional levels were selected, of which 24 were male (77.4%) and 7 were female (22.6%). The average age of the healthcare providers was 44 ±9 years (mean ± SD). Over half of the participants were physicians (67%).

Table 4: Characteristics of healthcare providers at district and regional levels

Variables		Staff (n=31)	Percentage (%)
Gender	Female	7	22.58
	Male	24	77.42
Occupation	Physician	21	67.74
	Paramedic	7	22.58
	Other (Admin, Head of EPI...)	3	9.68

3.1.2 Knowledge about malaria control

Almost all respondents at the regional and district levels knew of the existence of a malaria control strategic plan (96.77%).

All interviewees knew of the existence of a policy on the pre-referral management of malaria cases.

A total of 20 interviewees (95.83%) confirmed the existence of a system enabling CHWs to refer severe malaria cases to a CSB.

Only 14.81% of healthcare providers mentioned the existence of a system enabling CHWs to refer severe malaria cases to a CHR, 22.22% from a CHR to a CHRR, and 18.52% from a CHRR to a University Hospital. Also, less than half (45.83%) of healthcare providers mentioned the existence of a referral system from a CSB to a CHR.

Most of them (74.19%) said that the referral system from a CSB to a higher level in their locality was operational.

Among the 31 healthcare providers, 20 (68.96%) mentioned the existence of a user guide for ARC and 19 (67.85%) confirmed the availability of management tools.

Table 5: Regional and district healthcare providers' knowledge of the pre-referral system

Variables		Staff* (n=31)	Per-centage (%)
Existence of a malaria control strategic plan	Yes	30	96.77
	No	1	3.23
Existence of a policy for the pre-referral management of malaria cases	Yes	31	100
	No	0	0
Existence of a referral system by CHWs to a CSB for severe malaria cases	Yes	23	95.83
	No	1	4.17
Existence of a referral system by CHWs to a CHRD for severe malaria cases	Yes	4	14.81
	No	23	85.19
Existence of a referral system from a CSB to a CHRD for severe malaria cases	Yes	11	45.83
	No	13	54.17
Existence of a referral system from a CHRD to a CHRR for severe malaria cases	Yes	6	22.22
	No	21	77.78
Existence of a referral system from a CHRR to a University Hospital for severe malaria cases	Yes	5	18.52
	No	22	81.48
Existence of other referral systems (self-referral) for severe malaria cases	Yes	5	18.52
	No	22	81.48
Referral system operational in the locality	Yes	23	74.19
	No	8	25.81
Existence of malaria management tools	Picture box	3	10.34
	Drug management datasheet	2	6.89
	Individual management form	3	10.34
	ARC user guide	20	68.96
	None	1	3.44
Existence of management tools at the time of the survey	Yes	19	67.85
	No	9	32.14

*sometimes staff has not responded

Table 6: Regional and district healthcare providers' knowledge about severe malaria

Variables		Staff* (n=31)	Per-centage (%)
Capacity of healthcare providers to recognise serious forms of malaria	Yes	31	100
	No	0	0
Mentioned signs of severity	High fever	14	46.6
	Persistent vomiting	3	10
	Seizures	10	33.3
	Coma	1	3.3
	Jaundice	2	6.6
Use of ARC in children under 5	Used by CHWs as a pre-referral intervention	27	96.43
	Used by CHWs to treat malaria	1	3.57

*sometimes staff has not responded



3.1.3 Situation of ARC at regional and district levels

Almost half district and regional healthcare providers (42.86%) reported having a problem with RDT procurement. Given that 41.6% of ordered RDTs and 42.85% of ordered ARC were not received on time, 73.34% of these healthcare providers had an ARC supply problem.

Table 7: Situation of malaria inputs at regional and district levels

Variables		Staff* (n=31)	Per-centage (%)
Existence of RDT stocks	Yes	30	96.77
	No	1	3.23
Origin of RDTs	SALAMA	26	92.85
	TFP (USAID, NGO, ...)	2	7.14
Problems with RDT procurement	Yes	12	42.86
	No	16	57.14
Mentioned signs of severity	Orders not fulfilled on time	5	41.6
	Products unavailable from sources	1	8.3
	Quantity obtained below that ordered	4	33.3
	Other (procurement problems at national level, etc.)	2	16.6
Existence of ARC at the time of the survey	Yes	19	61.29
	No	12	38.71
Origin of ARC	SALAMA	16	94.11
	Other (redeployment from other regions, etc.)	1	5.88
Problems with ARC procurement	Yes	22	73.34
	No	8	26.67
Problems mentioned with ARC procurement	Orders not fulfilled on time	6	42.85
	Products unavailable from sources	1	7.14
	Quantity obtained below that ordered	2	14.28
	Late delivery	1	7.14
	Other	4	28.57

*sometimes staff has not responded

Furthermore, a quarter of the respondents (25%) said they did not have enough CSBs to train beforehand. The most common reasons given include the lack of reply to the CSB's call (28.57%), the lack of information provided to the District Management Team (EMAD) and/or the COVID-19 pandemic (28.57%), and financial problems of regions and districts (14.29%). On average, healthcare providers received 5 training sessions, all training combined. District and regional healthcare providers trained on average 23 ±13 CSBs, with an average 25 ±12 (mean ± SD) CSBs in the district.

Table 8: Regional and district healthcare provider observations on ARC training

Variables		Staff* (n=31)	Per-centage (%)
Training on malaria	Yes	27	96.43
	No	1	3.57
Training on the use of ARC	Yes	25	89.29
	No	3	10.71
Relevance of ARC programme to local context	Relevant	27	87.10
	Not relevant (lack of logistic means, non-operational CHWs)	4	12.90
Relevance of the content of the training received	Relevant	27	90
	Not relevant	3	10
Relevance of training tools	Relevant	26	86.67
	Not relevant	4	13.33
Competence and capacity of trainers	Good	26	86.67
	Average	4	13.33
Duration of training	Adequate	21	75
	Too short	6	21.43
	Too long	1	3.57
Training of CSBs on ARC	Yes	27	87.10
	No	4	12.90
Number of training sessions given equal to the number previously fixed	Yes	27	90
	No	3	10
Number of CSBs trained equal to the number previously fixed	Yes	21	75
	No	7	25
Reasons mentioned for discrepancies	Time constraints	1	14.29
	Financial problems	1	14.29
	Human resources problems	1	14.29
	Lack of reply to CSB's call	2	28.57
	Other (EMAD itself not informed, safety issues, etc.)	2	28.57
Perception on a scale from 1 to 10 of the implementation of the malaria control programme	5 to 6	6	21.43
	7 to 8	18	64.29
	9 to 10	4	14.28

*sometimes staff has not responded

There is a statistically significant relationship between ARC training provided at district and regional levels and the existence of ARC in the district ($p=0.05$). ARC training influences the existence of ARC in the district, and this relationship is statistically significant.

Table 9: Factor associated with the availability of ARC in the health districts

Variable	Availability of ARC in the district		<i>p</i>
	Yes	No	
Availability of ARC training			0.05
Yes	17	8	
No	0	3	

3.2. Healthcare providers in Basic Health Centres (CSB)

Among the 83 healthcare providers interviewed, 59 (71.08%) received training on ARC. In most cases, the numbers of CSBs (75%) and CHWs (70.83%) scheduled to be trained were met. At the CSB level, 79 healthcare providers (96.34%) said that RDTs were available in their health facilities, 58 (69.88%) said that malaria drugs were not out of stock, but 56 (66.67%) said that they did not have any ARC.

A total of 71 CSB healthcare providers (85.54%) were informed of the latest recommendations regarding the treatment of severe malaria in children, and 65 (84.42%) said that ARC was used by the CHWs for pre-referral intervention.

The majority of CSB healthcare providers (97.22%) mentioned the relevance of the ARC programme.

3.2.1 Socio-demographic characteristics of CSB healthcare providers

Our study sample included 83 CSB healthcare providers, including 56 female providers (67.47%) and 27 male providers (32.53%). The mean age was 38 ± 10 years (mean ± SD), and 59 of them (71%) were paramedics.

Table 10: Socio-demographic characteristics of healthcare providers

Variables		Staff (n=83)	Percentage (%)
Gender	Female	56	67.47
	Male	27	32.53
Occupation	Physician	24	28.92
	Paramedic	59	71.08

*sometimes staff has not responded

3.2.2 Healthcare providers' observations regarding the training received

Over half the CSB healthcare providers received training on pre-referral intervention (71.08%). Almost all of them confirmed the relevance of the ARC programme (97.22%). Most of them agreed that the training tools were relevant (85.71%), that the trainers were competent (92.75%), and that the duration of training was relatively adequate (71.64%).

Table 11: Training of healthcare providers in Basic Health Centres (CSBs)

Variables		Staff* (n=83)	Per-centage (%)
Participated in a training on pre-referral intervention	Yes	59	71.08
	No	24	28.92
Relevance of training content	Relevant	68	97.14
	Not relevant	2	2.86
Relevance of training tools	Relevant	60	85.71
	Not relevant	10	14.29
Competence and capacity of trainers	Good	64	92.75
	Medium	4	5.80
	Poor	1	1.45
Duration of training	Sufficient	59	71.64
	Too short	25	28.36

*sometimes staff has not responded

3.2.3 Knowledge, Attitudes and Practices around malaria

Of the 83 health workers who participated in the study, 71 (85.54%) said they were aware of the latest recommendations for the treatment of severe malaria in children.

The majority of healthcare providers (84.42%) said that ARC was used by CHWs for pre-referral intervention.

Table 12: Knowledge, Attitudes and Practices of healthcare providers

Variables		Staff* (n=83)	Per-centage (%)
Informed of the latest recommendations on the treatment of severe malaria in children	Yes	71	85.54
	No	12	14.46
HCP using ARC to treat malaria	Yes	3	3.90
	No	74	96.10
HCP using ARC to treat severe malaria	Yes	10	12.99
	No	67	87.01
HCP using ARC to treat community-based malaria	Yes	4	5.19
	No	73	94.81
HCP using ARC for pre-referral intervention	Yes	65	84.42
	No	12	15.58
Relevance of the ARC programme	Relevant	70	97.22
	Not relevant	2	2.78

3.2.4 Malaria management by healthcare providers

Regarding input availability, 79 healthcare providers (96.34%) confirmed the availability of RDTs, and 58 (69.88%) confirmed the availability of drugs to treat severe malaria.

Table 13: Malaria case management by healthcare providers

Variables		Staff* (n=83)	Per-centage (%)
RDT available at the time	Yes	79	96.34
	No	3	3.66
Drugs available to treat severe malaria	Yes	58	69.88
	No	25	30.12
Origin of RDT	PHAGEDIS	78	93.97
	Direct TFP	1	1.20
	Other	3	3.61
	RDTs never available	1	1.10
Origin of drugs to treat severe malaria	PHAGEDIS	75	90.36
	Direct TFP	3	3.61
	Buying/borrowing from pharmacies	1	1.120
	Never available	4	4.82
RDT free of charge	Yes, completely	82	98.80
	Only minimal contribution	1	1.20
Severe malaria treatment free of charge	Yes, completely	49	59.76
	Not at all	22	26.83
	Only minimal contribution	11	13.41
Causes preventing the population's access to CSB services	Cultural	22	26.5
	Financial	26	31.32
	Geographical (too far)	27	32.53
	Other	8	9.65

*sometimes staff has not responded

Over half healthcare providers (66.67%) declared that ARC was unavailable at the time of the survey, and almost half declared that they were never supplied with ARC. Almost all healthcare providers (96%) declared having given at least one training session on ARC.

Table 14: Situation of ARC management in CSBs

Variables		Staff* (n=83)	Per-centage (%)
Origin of ARC	PHAGEDIS	51	62.96
	Direct TFP (ONG, USAID)	1	1.23
	Other	3	9.88
	Never available	21	25.92
ARC available at the time	Yes	28	33.73
	No	55	66.27
Last supply of ARC	Less than 3 months ago	24	29.63
	3 to 6 months ago	11	13.58
	Over 6 months ago	10	12.35
	Never	36	44.44
Frequency of ARC supply to CHWs	Not fixed (on request)	28	39.44
	Monthly	1	1.41
	Quarterly	2	2.82
	Other (only if available)	40	56.34
Frequency of RDT supply to CHWs	Not fixed (on request)	44	56.41
	Monthly	8	10.26
	Quarterly	3	3.85
	Other (only if available)	23	23.49

*sometimes staff has not responded

3.2.5 Observations of CSB Heads regarding CHW training

Most healthcare providers (61.64%) declared having given a training on ARC to less than 15 CHWs attached to their CSB. Visual aids were widely used for CHWs training (74.61%). A total of 41 healthcare providers (65.08%) said that the tools used were very relevant, and 57 (89.06%) declared that the training content was appropriate to achieve the objectives for CHWs.

Table 15: Training of CHWs by CSB Heads

Variables		Staff* (n=83)	Per-centage (%)
CHW training on ARC	Yes	51	60.71
	No	32	39.29
Number of training sessions given	1	48	96
	2	1	2
	3 and above	1	2
Was the number of training sessions given equal to the number previously defined?	Yes	51	73.91
	No	18	26.09
Number of trained CHWs	1 to 15	45	61.64
	16 and above	28	38.36
Total number of CHWs attached to the CSB	1 to 15	27	35.06
	16 to 30	36	45.75
	31 and above	14	18.18
Was the number of trained CHWs equal to the number previously defined?	Yes	51	70.83
	No	21	29.17
Tools used to train CHWs	Visual aids	47	74.61
	Methods requiring everyone's participation	5	7.93
	Other	11	17.46
Relevance of tools used to reach these objectives	Very relevant	41	65.08
	Moderately relevant	16	25.40
	Not relevant	6	9.52
Training content appropriate to reach the objectives for CHWs	Yes	57	89.06
	No	7	10.94
Adjustments made to some aspects of training	Yes	33	51.56
	No	31	48.44

*sometimes staff has not responded

Table 16: Distribution of the number of trained CHWs by healthcare providers per district

Variables		Staff* (n=83)	Per-centage (%)
Ambatoboeny	1 to 15	3	60
	16 and above	2	40
Amparafaravola	1 to 15	4	66.67
	16 and above	2	33.33
Andilamena	1 to 15	3	50
	16 and above	3	50
Bekily	1 to 15	6	100
	16 and above	0	0
Farafangana	1 to 15	4	50
	16 and above	4	50
Fenoarivobe	1 to 15	3	50
	16 and above	3	50
Ihosy	1 to 15	2	25
	16 and above	6	75
Kandreho	1 to 15	3	75
	16 and above	1	25
Marovoay	1 to 15	1	25
	16 and above	3	75
Tolanaro	1 to 15	4	100
	16 and above	0	0
Tsihombe	1 to 15	7	100
	16 and above	0	0
Vangaindrano	1 to 15	3	60
	16 and above	2	40
Vondrozo	1 to 15	2	50
	16 and above	2	50

*sometimes staff has not responded

3.2.6 Healthcare providers' (EMAR, EMAD and CSB Heads) perception of the strategy's implementation

The interviews with CSB Heads and district and regional management teams focused mainly on the following points:

- ⦿ Their opinion on the ARC training they received
- ⦿ Their opinion on the training they gave to the CHWs
- ⦿ Their perception of the ARC programme
- ⦿ Factors that may have a negative influence on the ARC programme
- ⦿ Their opinion on the national malaria control policy
- ⦿ Problems with the malaria control policy
- ⦿ Training on ARC: positive feedback despite the unavailability of ARC

All respondents said that they were very satisfied with the ARC training they had received. No comments were made regarding the content of the training, its clarity, its objectives, the ability of the trainers or its overall relevance to the context. Everyone said that they had gained important knowledge and information during the training.

Some rather negative comments were made about training tools and materials. While the use of the picture box was considered by healthcare providers as a very good technique that helped them understand and learn more easily, the unavailability of artesunate rectal capsules as a training tool was seen as a limitation. The other materials used (especially cards and leaflets) were also mentioned as inadequate.

“ Personally, I found this training satisfactory and very practical. We were taught easy and effective procedures, which above all helped us save lives. What I mean by this is that the rectal route of administration is easier for CHWs, as they don't have to give injections. The treatment is also easier for patients as they no longer need to find something to swallow or drink. The simple fact that the country has made artesunate available to us is enough. It is necessary, especially in very remote areas, far away from the CSB.” (CSB Head, Vondrozo)

“ The training session started with some theory, followed by practice and a demonstration on how to really use it. That's where the problem was. This is the child and this is how artesunate rectal capsule is administered. Normally the product should be available for demonstration. We couldn't demonstrate it because we did not have any.” (CSB Head Physician)

3.2.6.1 CHW training by CSB Heads

When asked about the training they provided to CHWs, the CSB Heads said that the CHWs were very interested in it. Two main reasons were put forward to explain this interest:

- ⦿ The CHWs were aware of the challenges associated with malaria control;
- ⦿ They were given a training allowance.

Regarding the tools and materials used, the CSB Heads said that they were up to the task and that they allowed them to conduct the training properly. However, some points still needed to be improved, particularly:

- ⦿ The availability of ARC to demonstrate its use (the product not being available, some trainers could only provide theoretical information while others used paracetamol suppositories for the demonstration);
- ⦿ There was little to no budget to print the training tools, which forced the CSB Heads to pay out of their own pockets.

“ We distributed a template to the CHWs during their training, which they read and followed in detail, and I noticed that the training went well. We followed the steps described in the training datasheet.” (CSB Head, Farangana)

“ They were very interested in the training because the severe form of malaria has always been a real problem in our society. Before the arrival of ARC, patients with severe malaria symptoms were transferred immediately to the hospital. CHWs were therefore very interested in the training because they know that this pre-referral intervention will help them save the lives of children with malaria.” (CSB Head, Vondrozo)

“ The only concern was that we did not have enough material to train the CHWs afterwards. Hence, the CSB Head must pay out of his own pocket to have more material printed so that the CHWs can understand and follow the instructions.” (CSB Head Physician)

3.2.6.2 Positive perception and understanding of the ARC programme

All respondents showed a good understanding of what artesunate rectal capsule is and of the relevance of this programme to meet the objective of reducing malaria mortality.

As the programme is only in its start-up phase, healthcare stakeholders provided many more assumptions regarding ARC efficacy than evidence-based arguments. Nevertheless, given that artesunate is now recognised as effective against malaria, the programme is perceived as effective by healthcare providers. The programme was generally well understood, and the terms “pre-referral” and “community health worker” were almost always used by the participants when talking about ARC. Healthcare providers understood clearly that ARC will be used mainly by CHWs in malaria RDT-positive children with severe symptoms before their referral to the CSB, where they will receive a complete malaria treatment.

“ There are several things to do before using ARC. First of all, the CHW must perform an RDT which must be positive, and the child must present danger signs associated with severe malaria. The child's age and weight must be checked, because the dose to administer is based on weight and age. The warning signs that I mentioned must be confirmed, and when this is done, artesunate rectal capsule must be administered. Then the referral slip must be completed and the child must be transported to the CSB as soon as possible to continue the treatment.” (CSB head, Amparafaravola)

“ Er... Broadly speaking? How can I explain? Er... Well to start with, artesunate rectal capsule is... Er, the medicine is inserted... Er... in the child's rectum. This is the simplified definition. It is used in children aged 6 to 59 months with severe malaria. Prior to the child's referral of the CSB, before being given the medical treatment. That is the simplified definition of artesunate rectal capsule.” (CSB Head, Vondrozo)

3.2.6.3 Situations which could have a negative impact on ARC

Not all healthcare providers have a clear understanding of what the ARC programme is, and this could jeopardise the programme's scaling up. In addition, some practical concerns also need to be addressed. Sometimes artesunate rectal capsule is considered as a substitute for injectable or oral artesunate. It is thus perceived as suitable for certain categories of patients for whom the administration of parenteral or oral medicinal products is difficult (e.g. vomiting children, children with difficult venous access, etc...).

“ You see, usually we use injectable artesunate and sometimes it is very difficult for us to find the veins of the child. Sometimes even, they burst. This delays the treatment, but now with artesunate rectal capsule, we are able to treat faster.” (CSB Head Physician)

“ If it is a severe form or if the child is not eating or vomits, we can use artesunate rectal capsule. It can be effective, and in my opinion we can have quicker results.” (District Management Team, Amparafaravola)

In addition to this confusion about the meaning and significance of ARC, two main concerns were also raised by some of the participants and should be clarified in the future: the timeframe between the administration of artesunate rectal capsule and of injectable artesunate once the child arrives at the health centre, and ARC storage conditions given the country's context (heat, cold chain failure, etc.).

“ Once the CHW has administered ARC, when the baby arrives at the CSB, how soon can he receive the next dose of artesunate? Can the baby be given antimalarial drugs or must we wait 12 hours before giving the injection?” (CSB Head, Vangaindrano)

“ If in addition to malaria, the child also has diarrhoea, then what should the CHW do? Diarrhea can be one of the symptoms of malaria. Of course they will not be able to use ARC in children with diarrhea. Also, given the heat in our country, it is difficult to store artesunate. These are problems.” (CSB Head, Vondrozo)

3.2.6.4 National malaria control policy: a relevant policy

For individuals working in the health sector, the national malaria control policy includes 3 components: prevention, diagnosis and management.

The preventive components of the current national policy most often used to raise the population's awareness included a clean environment that is not conducive to the development of mosquitoes, the distribution of insecticide treated nets (ITNs), indoor residual spraying (IRS campaigns), and intermittent preventive treatments (IPT) for pregnant women. In terms of malaria diagnosis and management, rapid diagnostic tests (RDTs) in patients with fever and treatment with antimalarial drugs if malaria is confirmed were considered as part of this strategy.

The policy and strategies used were perceived as relevant to the country, especially as a large part of them are offered free of charge to the population, most of which faces serious financial difficulties.

“ The Malagasy government's policy and strategies to control malaria are, in my opinion, very appropriate and effective because all malaria care and especially drugs are free of charge. In addition to drugs, insecticide treated nets are also distributed free of charge to the parents of children under the age of five when they come to the CSB for consultations.” (CSB Head, Vondrozo)

“ The country has a well-defined strategy because all patients with fever are given a malaria RDT. And this is how we identify those with malaria. Patients with a positive RDT will thus receive treatments different from those who are negative.” (CSB Head, Bekily)

3.2.6.5 Relevant malaria control policy facing structural and economic problems

Although they considered the national policy as relevant and effective, the interviewees raised the problem of the access to its various offers as still being a major challenge for the country. These access issues can be explained by structural or economic factors.

a) Structural factors

Some of the problems of the malaria control policy could be considered structural and would require a long-term effort to solve them. They can be related to the population, to the beneficiaries of health services, and also to the context and reality of the health system in general. They can limit access to healthcare either individually or together.

The following elements were most frequently mentioned:

- ⦿ Cultural beliefs: malaria is explained by supernatural events and witchcraft, and injections in the human body with a metal object are forbidden (thus making parenteral treatment impossible). Sleeping under a mosquito net is also perceived as negative (especially if it is white) because it conveys the image of a corpse;
- ⦿ Lack of interest for preventive interventions is often linked to low-level knowledge and education;
- ⦿ Resorting to non-conventional forms of healthcare (particularly traditional healers);
- ⦿ Poverty: the population always associates going to a health centre with things to buy, bills to pay, and related expenses (food, accommodation, travel, etc.). Some individuals simply prefer not to go to the health facilities;
- ⦿ The problem of remoteness and difficult geographical access to the health facilities;
- ⦿ Some aspects of the programme are not suited to the reality in the field: oversized nets compared to the house, asking people not to stay out late when it is a cultural behaviour which carries meaning, etc.

“ Nevertheless, in remote areas or in villages, malaria is still perceived by the population as being associated with witchcraft.” (CSB Head Physician, Vondrozo)

“ Frankly, it's a problem of money. They think that going to Bekily is too expensive. When farmers come, they bring their families. It is the parents who take care of them. Patients always come with several accompanying adults. A patient with severe malaria sometimes comes with 50 carers.” (CSB Head, Bekily)

“ The first difficulty in our district is the distance between people (the community) and the health centre. Look at the 110 fokontany in the Tsihombe district for example, where one of the villages attached to our CSB2 is 40 km away. This makes it difficult, especially for patients with severe malaria. They are forty km from any physician; it's very worrying.” (CSB Head, Tsihombe)

“ Let's take the example of Androy in our territory, where it is really tough to convince people to use mosquito nets. The huts are too small, really very small, the net is almost as large as the house, it covers the whole house. That is the first problem. Secondly, here too, sleeping under a white cloth is taboo. It is true though that recently the colour has been changed to blue. That's all I have to say, case management is fine, but I am not sure about prevention. I don't know, maybe we need to carry out surveys like this one, at the village level to determine the method to use. It's not a change but an improvement.” (District Management Team, Tsihombe)

b) Economic factors

Some of the problems raised are more of an economic nature and could be solved quicker. They have more to do with supply.

- Frequent input shortages

The unavailability of malaria inputs (ACTs, RDTs, etc.) was the main difficulty mentioned by the respondents. Indeed, malaria inputs may not be available at the district pharmacy itself, which then affects all the lower outlets (CSBs and CHWs). Sometimes, inputs are available but only in limited quantities, and in this case, shortages affect particularly CHWs, also because some of the products are diverted to the CSBs to meet the needs of the people who go directly there.

“ During the rainy season, the river overflows and people can no longer come to the CSB. CHWs run out of drugs or other inputs, and there is nothing they can do. The prevalence of malaria then increases.” (District Management Team, Fenoarivobe)

“ There are many CHW training sessions on offer, but not enough is done to implement them due to drug shortages. So the people who go to the CHWs can neither be tested nor treated as both RDTs and drugs are lacking, and they are forced to go to the CSB even if the CHW is closer.” (CSB Head, Vangaindrano)

- A cooperation issue

The various health facility levels do not always cooperate, and this affects malaria data reporting and the harmonisation of activities. Some respondents mentioned a lack of reporting at the higher level (CHWs to CSBs, and CSBs to District level). Also, there is little or no supervision from the higher to the lower level.

“ There is a problem with CHWs, because they order RDTs and ACTs but they do not send monthly reports which hinders the management of inputs. However, at the district level, everything is fine.” (CSB Head, Marovoay)

“ CHWs are supervised by CSB Heads, who remind them daily to do this, do that, because reports must be filled in and signed every day. It is such reminders from CSB Heads that are really lacking, so after a while CHWs become negligent.” (District Management Team, Ambatoboeny)

3.2.6.6 Suggestions of healthcare providers

To ensure the success of the malaria control policy in general and of the ARC programme in particular, the interviewed healthcare providers put forward a number of proposals. We grouped these proposals into different categories and in descending order of reported frequency:

1. Ensuring permanent availability of malaria inputs and ARC at the community sites and in CSBs;
2. Improving knowledge of healthcare providers and CHWs on an on-going basis through training;
3. Raising awareness among the population;
4. Providing financial incentive to the CHWs who work on a voluntary basis because they also need to provide for their families;
5. Improving coordination and cooperation between all health system levels;
6. Reinforcing monitoring and supervision;
7. Increasing the number of staff.

3.3. Community Health Workers (CHWs)

Training was planned for 1516 CHWs and 108 CSBs and was confirmed for all these healthcare providers (100%). However, the study showed that 29.24% (50/171) of the CHWs had not received any training.

Regarding management tools at community level, 97 CHWs (59.88%) had no working tools for ARC, 122 (72.62) had no consultation records for children aged 2 to 11 months, 93 (55.36%) had no consultation records for children aged 1 to 5 years, and 84 (49.59%) had no referral and counter-referral slips. Regarding malaria inputs, 97 CHWs (57.06%) had no RDTs and 142 (83.04%) had no ARC.

Regarding CHWs' knowledge about the system, 121 (87.68%) mentioned that the patient's transfer to the CSB following an ARC prescription is a step in the management of severe malaria in children. However, 87 CHWs (73.73%) did not administer ARC to a patient with severe malaria.

3.3.1 Socio-demographic characteristics of CHWs

A total of 171 CHWs were included in our study sample. Among them, 115 CHWs were female (67.25%) and 56 were male (32.75%), with an mean age of 43 years \pm 10 (mean \pm SD). Farmers constituted over half the sample (76%). The CHWs have an average of 4 \pm 2 (mean \pm SD) dependent children.



Table 17: Socio-demographic characteristics of CHWs

Variables		Staff* (n=171)	Per-centage (%)
Gender	Female	115	67.25
	Male	56	32.75
Occupation	Shopkeeper	9	5.26
	Farmer	130	76.02
	Housewife	9	5.26
	Civil servant	9	5.26
	Other	14	8.18
Education	Primary	34	19.88
	Lower secondary	113	66.08
	Higher secondary	23	13.45
	Higher education (university)	1	0.58
Marital status	Single	14	8.19
	Divorced	15	9.77
	Married	132	77.19
	Widow/Widower	10	5.85
Presence of a centre close to home	Yes	126	74.12
	No	44	25.88
Means of transport	Walking	124	72.51
	Bicycle	21	11.69
	Motorbike	4	2.33
	Canoe	5	1.16
	Cart	10	5.84
	Car	5	2.92
	Other	2	1.16
Time to get to the training centre	<120 min	145	85.29
	121 - 240 min	19	11.18
	>240 min	6	3.53

*sometimes staff has not responded

3.3.2 Training on ARC

A total of 121 CHWs (70.76%) from the 8 regions received training on ARC. In the Androy region, 44 CHWs (26.67%) reported that they had not received any training on ARC.

Table 18: Distribution of ARC training per region

Regions		Staff* (n=171)	Per- centage (%)
Alaotra Mangoro	Yes	13	60
	No	0	40
Androy	Yes	16	66.67
	No	44	33.33
Anosy	Yes	13	50
	No	0	50
Atsimo Atsinanana	Yes	28	100
	No	0	0
Betsiboka	Yes	5	50
	No	0	50
Boeny	Yes	28	50
	No	5	50
Bongolava	Yes	10	25
	No	1	75
Ihorombe	Yes	8	75
	No	0	25

*sometimes staff has not responded

Regarding training frequency, 101 CHWs (84.17%) received only one training session and 107 (88.43%) were trained by CSB Heads.

A total of 114 CHWs (82.61%) said that the training was relevant. Among interviewed CHWs, 117 (86.67%) and 84 (63.16%) said that the quality of the trainers was good and that the duration of training was adequate, respectively.

Table 19: Training characteristics

Variables		Staff* (n=171)	Per-centage (%)
Number of ARC training sessions	1	101	84.17
	2	18	15
	3	1	0.83
Trainer on ARC	CSB Head	107	88.43
	Other	14	11.57
Relevance of ARC training	Relevant	114	82.61
	Not relevant	24	17.39
Relevance of training tools	Relevant	92	68.15
	Not relevant	43	31.85
Competence and capacity of trainers (quality of training)	Good	117	86.67
	Poor	4	2.96
	Medium	14	10.37
Duration of training	Adequate	84	63.16
	Too short	37	27.82
	Too long	12	9.02

*sometimes staff has not responded

3.3.3 CHWs Knowledge, Attitudes and Practices around malaria

3.3.3.1 Knowledge

Of the 171 CHWs interviewed, 144 (84.2%) said that RDTs are the diagnostic tool for malaria. In addition, 97 (56.72%) said that a high fever is the most common sign of severe malaria, and 29.79% said that a positive RDT with at least one sign of severe malaria is an indication for ARC. For 80 CHWs (51.61%), age alone was the main parameter to determine the dose to be used. About three quarter of CHWs did not administer ARC to patients with signs of severe malaria. Also, 87.68% of CHWs mentioned that after the prescription of ARC, the patient was referred to the CSB. In total, 144 (84.2%) and 96 CHWs (57.14%) did not have a thermometer or a baby scale, respectively.

Table 20: CHW knowledge about malaria

Variables		Staff* (n=171)	Per- centage (%)
Malaria diagnosis	RDT	144	84.2
	Fever	26	15.2
	Other	1	0.06
Signs of severe malaria	High fever	97	56.72
	Persistent vomiting	6	3.5
	Seizures	25	14.61
	Coma	37	21.63
	Other (pallor, respiratory distress, prostration, jaundice, etc.)	6	3.5
Criteria for administering ARC	At least one sign of severe malaria	36	25.53
	Positive RDT	21	14.89
	Positive RDT and at least one sign of severe malaria	42	29.79
	Other	42	29.79
Parameters to determine the dose to be used	Age and weight	55	35.48
	Age only	80	51.61
	Weight only	5	3.23
	Other (brachial perimeter, severity of fever, do not know, etc.)	15	9.68
Care after administering ARC	Referred to a CSB	121	87.68
	Sent back home	7	5.07
	Kept at CHW site	5	3.62
	Other (depends on the course of the disease, do not know, etc.)	5	3.62
Step 1	Done	79	55.63
	Not done	63	44.37
Step 2a	Done	65	47.10
	Not done	73	52.90
Step 2b	Done	92	66.19
	Not done	47	33.81
Step 3 (administration of ARC if sign of severe malaria)	Done	87	73.73
	Not doen - No sign of severe malaria	31	26.27
Thermometer available	Yes	26	15.48
	No	142	84.52
Baby scale available	Yes	72	42.86
	No	96	57.14

*sometimes staff has not responded

Among trained CHWs, those in Anosy had no teaching material, those in Atsimo Antsinanana had no posters, those in Betsiboka only had teaching material, and those in Bongolava had no picture boxes.

Table 21: Use of training material per region

Training material		Staff* (n=171)	Per-centage (%)
Alaotra Mangoro	Teaching material	6	46.15
	Posters	2	15.38
	Picture box	2	15.38
	Other (Q&A, brainstorming, etc.)	3	23.07
Androy	Teaching material	4	25
	Posters	6	37.5
	Picture box	3	18.75
	Other (Q&A, brainstorming, etc.)	3	18.75
Anosy	Teaching material	0	0
	Posters	1	7.69
	Picture box	5	38.46
	Other (Q&A, brainstorming, etc.)	7	53.84
Atsimo Atsinanana	Teaching material	13	46.42
	Posters	0	0
	Picture box	3	10.71
	Other (Q&A, brainstorming, etc.)	12	42.85
Betsiboka	Teaching material	5	100
	Posters	0	0
	Picture box	0	0
	Other (Q&A, brainstorming, etc.)	0	0
Boeny	Teaching material	20	71.42
	Posters	1	3.57
	Picture box	1	3.57
	Other (Q&A, brainstorming, etc.)	6	21.42
Bongolova	Teaching material	5	50
	Posters	1	10
	Picture box	0	0
	Other (Q&A, brainstorming, etc.)	4	40
Ihorombe	Teaching material	4	50
	Posters	1	12.50
	Picture box	2	25
	Other (Q&A, brainstorming, etc.)	1	12.50

*sometimes staff has not responded

3.3.3.1 Attitudes and practices around malaria and input sources

CHWs reported purchasing RDTs on average 3±6 (mean ± SD) times a year. Most CHWs said they did not use consultation registers, including for children aged 2 to 11 months (72%) and children aged 1 to 5 years (55%). In addition, over half the CHWs (57.06%) reported not having any RDTs in their community site.

Table 22: Practices and inputs for malaria control

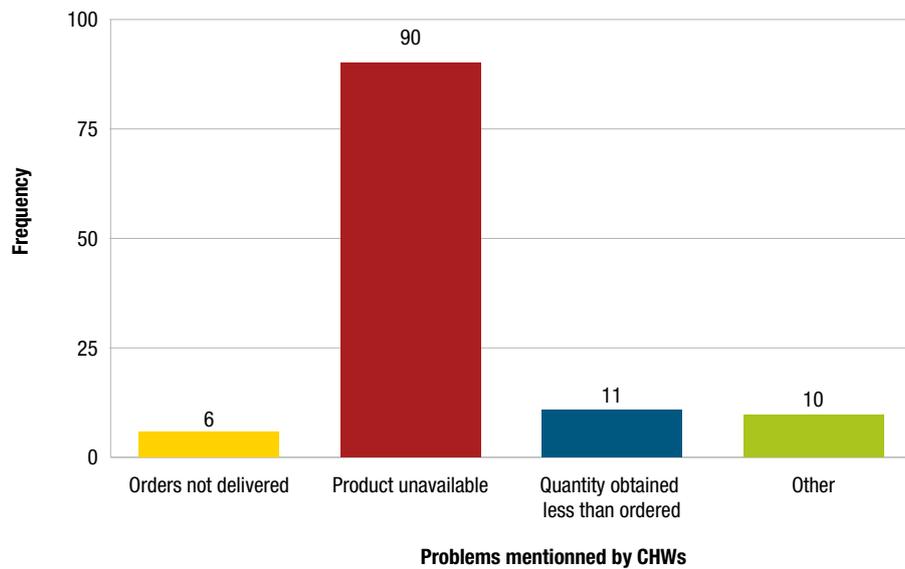
Variables		Staff* (n=171)	Per- centage (%)
ARC working tools	Picture box	10	6.17
	Drug management sheet	4	2.46
	Individual case report form	17	10.49
	ARC user guide	34	20.98
	None	97	59.88
Consultation register available for patients aged 2 to 11 months	Yes	46	27.38
	No	122	72.62
Consultation register available for patients aged 1 to 5 years	Yes	75	44.64
	No	93	55.36
Consultation register available	Yes	91	54.17
	No	77	45.83
Referral and counter-referral slips	Yes	86	50.59
	No	84	49.59
RDT available at the site	Yes	73	42.94
	No	97	57.06
Origin of RDT	Health centre	65	89.04
	Drug warehouse	4	5.47
	Pharmacy	2	2.74
	Other (other CSB)	2	2.74

*sometimes staff has not responded

3.3.4 Problems encountered by CHWs

Most CHWs had no inputs. Over three quarters CHWs (76.92 %) declared that the product was not available from ordering sites.

Figure 3: Problems mentioned by CHWs regarding RDT orders



Almost all CHWs (84.80%) declared having a problem with ARC procurement, the most common reason given by the CHWs (84.13%) being the product’s unavailability from ordering sites.

Table 23: Malaria control problems mentioned by CHWs

Variables	Staff* (n=171)	Per-centage (%)
Problems to acquire RDTs	Yes	118 69.82
	No	51 30.18
Problems mentioned	Orders not fulfilled on time	6 5.12
	Products unavailable	90 76.92
	Quantity obtained less than ordered	11 9.40
	Other (personal purchase, respondent unable to reply)	10 8.54
ARC available at the site	Yes	29 16.96
	No	142 83.04
Origin of existing ARC	Health centre	28 96.55
	Other (pharmacy, drug warehouse, etc.)	1 3.45

...

...

Number of ARC procurements per year	0	85	60.71
	1	49	35
	2	5	3.57
	2 and above	1	0.71
ARC procurement problems	Yes	145	84.80
	No	26	15.20
ARC procurement problems mentioned	Products unavailable	122	84.13
	Quantity obtained less than ordered	5	3.44
	Other (unaware of its existence, out-of-date, etc.)	8	12.41

*sometimes staff has not responded

3.3.5 CHW perception of training received and strategy

All interviewed CHWs were trained as part of the implementation of the ARC programme. Most of them received this training in March 2020, and some of them in April 2020. The training sessions were provided by CSB Heads.

All interviewees said that the training was relevant to their own situation as well as to the country's malaria control objectives. In addition, they all mentioned the training's contribution to improving their knowledge and practices regarding the management of malaria in general, and of severe malaria in particular.

“What we took from this training we used to treat children up to 5 years old. A lot of it was new knowledge on communication and raising awareness. Our trainer was efficient.”
(CHW, Fenoarivobe)

“After this training, we knew how to differentiate severe malaria from uncomplicated malaria.”
(CHW, Amparafaravola)

Nevertheless, some points to be improved were mentioned.

Tools, teaching aids and materials used during training: While all CHWs said that the tools used by the trainers were relevant and interesting, they indicated that they were not adequate. The main problem was the lack of ARC during training, which meant that a proper demonstration could not be carried out. Some CHWs with limited writing skills felt particularly penalised by this lack of practical exercise, which they felt would be the most appropriate way to fill in the gaps.

“As my writing skills are limited, I believe a practical training would be better. For me, it's visual memory that helps me remember information. I think we should improve this aspect.”
(CHW, Kandrehu)

“I think that everything was clear, but the only problem was that the drugs did not arrive on time and so we could not practice. As a result, we found it hard to remember the whole training.”
(CHW, Fenoarivobe)

Clarity of training: The comments of some CHWs show that some essential points were not well understood during the training. These include how to use artesunate rectal capsule in children with diarrhea, and also how to make sure that the capsule is not expelled by the child, as it is not always possible to ask the child to contract his/her anal sphincter after the capsule has been administered.

“For example, if once ARC has been inserted the child's buttocks are not squeezed together correctly, the capsule could easily come out.” (CHW, Marovoay)

“What should we do if the child has diarrhea? This was not well understood.” (CHW, Vondrozo)

3.3.5.1 Factors that can positively influence the national control policy in general and the ARC programme in particular

a) Good knowledge and positive perceptions of the country's malaria control strategies

CHWs seemed to have a fairly good knowledge of the malaria control strategies put in place by the country. They mentioned prevention, diagnosis and treatment as the main components of the policy. They also declared that they comply fully with these strategies, which they find relevant. This knowledge and compliance with the national policy is a great opportunity to scale up the ARC programme and malaria control in Madagascar.

“ CHWs training on the management of children under 5 is part of the strategy implemented by the country. This is one of the priorities because some areas are too far from health centres, and CHWs have been trained to manage these cases.” (CHW, Amparafaravola)

“ I think Madagascar has put in place policies and strategies. They include providing care for people with malaria, slowing down the rise in malaria deaths, and using prevention measures such as the distribution of insecticide treated nets.” (CHW, Fenoarivobe)

“ In our country it is effective because the government provided materials, drugs and long-lasting insecticidal nets. It has also given us this drug to treat malaria, it is obvious that it is effective. Those who are very sick, those who have severe malaria are referred to the CSB, and the rate of child morbidity has fallen. It is not like before, thanks to the CHWs.” (CHW, Farafangana)

b) Adequate knowledge about uncomplicated malaria and severe malaria

The CHWs comments showed they had a good knowledge of malaria, in particular with regard to the distinction between uncomplicated and severe malaria. In all cases of fever, an RDT must be performed to confirm the diagnosis of malaria, and the child's symptoms will help determine whether it is severe or uncomplicated. CHWs declared that uncomplicated malaria is often associated with fever and chills. In severe malaria, these two main symptoms are present with other signs perceived as more worrying, such as vomiting, seizures or stiffness in the neck.

“ People don't know that a test must be made to confirm that it is malaria. If the child has fever, a headache or vomits, an RDT is performed and if the test is positive, only then do we know it is malaria.” (CHW, Farafangana)

“ In fact people...as Claudia said, you can't tell right away that it is malaria, only after doing the RDT. Yes, you can't tell right away that it's malaria. Febrile patients must be tested first. You need to have the results of this test before you can decide what to do, if you have the means (speaks loudly and points the index finger). If material is lacking, the patient is given a referral slip for the CSB. CSBs see many people coming from remote areas, because they often come here first.” (CHW, Ihosy)

“ There are many signs associated with severe malaria: children have seizures or are in a coma. In these cases, we administer an artesunate rectal capsule and refer them to the CSB.” (CHW, Vondrozo)

c) Favourable opinion on the ARC programme

In general, CHWs have a good understanding of the ARC programme. The programme is understood as a measure to help reduce severe malaria mortality in children under 5 by administering ARC in the rectum prior to their transfer to the CSB with a referral and a counter-referral slip. The interviewees said that this programme was beneficial for malaria control in Madagascar, because a large part of the population lives very far from health facilities with a risk of delayed treatment in case of severe malaria.

“ What do I tell the parents? Excuse me but this medicine must be inserted into your child's rectum to protect him because he has severe malaria, and this is the emergency treatment until he arrives at the hospital.” (CHW, Farafangana)

“ There are results and it is effective. We refer the patient to the CSB after administering the artesunate rectal capsule. The patient is then sent back here with the drugs prescribed by the doctor, and he is sure to be cured.” (CHW, Ihoisy)

3.3.5.2 Challenges still to be met to win the fight against malaria

In addition to the relevance of the different components of the national malaria policy mentioned by the CHWs, problems that could threaten the policy were also raised.

a) Delay in seeking care by the population

The delay in seeking care from CHWs or CSBs is thought to be a consequence of parents' preference for traditional healers and self-medication for their sick children. This means that children are taken to the CSB or to a CHW at a very advanced stage, when other recourses have failed. The reason for such behaviour is often due to their age-old culture, habits and practices, as well as the distance to health facilities.

“ Some people live in villages very far from the CSB. They believe that the disease comes from witchcraft so they go elsewhere to find a cure. It is only when they fail there that they decide to go to the hospital, when the disease has become severe.” (CHW, Vondrozo)

“ When children arrive here, they are very weak because they were first taken to see a marabout who gave them herbs that produced no result. In the end, they go to the hospital. And yet they had been told to go to the CHW.” (CHW, Ambatoboeny)

b) Malaria input shortages

Community workers also said that they are penalised by frequent shortages of malaria inputs (ACTs, RDTs, management tools). They regret this situation, particularly because it goes against their main role to raise awareness. They are expected to inform people on what to do in case of a health problem, provide health advice and also convince parents to bring their children to them when they have a fever. Awareness leads people to consult CHWs when necessary, but if they do not have any malaria consumables and inputs, they cannot help the patient and thus find themselves in an embarrassing situation.

“ At the moment, the problem is drugs. Although our training sessions have taught us what to do and we want to do it, the lack of drugs remains a problem. As a result, we have to send the children to the hospital for emergency treatment. What's more, we have no more RDTs at the moment.” (CHW, Amparafaravola)

“ The problem is the supply of inputs. When we ask for RDTs and drugs, we do not receive them immediately. We are here to motivate people, but when they come to us, we don't have materials to use or drugs to give.” (CHW, Marovoay)

“ Every morning, we take in five to ten children. But since tests and drugs have run out, we send patients directly to the doctor.” (CHW, Bekily)

c) Population resistance to awareness campaigns

Some of the interviewed CHWs regretted certain people's reluctance regarding awareness campaigns, particularly regarding the use of mosquito nets, even though they are distributed free of charge. CHWs know their community and they attributed this reluctance more to a lack of interest than to cultural conditioning or poverty.

“The problem here is that we raise awareness on the necessity to sleep under an insecticide treated net but nobody takes any notice. They prefer to play with the disease and don't sleep under nets.” (CHW, *Ambatoboeny*)

“What complicates the fight against malaria is that there are still people who do not use the nets even though they are distributed free of charge. And when it comes to cleanliness, we CHWs have a duty to mobilise people but some don't care. This complicates the fight against this disease.” (CHW, *Vondrozo*)

d) Financial difficulties

Household financial problems are often mentioned by CHWs as an obstacle to malaria control. Some individuals do not go to healthcare providers because certain drugs used for malaria management (even ACTs or injectable artesunate if there is a shortage of ACTs in the health facilities) are not free of charge. In addition to the cost of treating malaria, there are also travel expenses, particularly for those living far from health facilities.

“Personally, I think that financial issues are also an obstacle in the fight against malaria. Unlike for children under 5, the treatment for adults costs a little and some households cannot afford it. This problem must be addressed.” (CHW, *Fenoarivobe*)

“There are many difficulties here because people don't have any money. If you want to go to hospital, there is no money, and if you want to use drugs, there is no money for that either.” (CHW, *Tsihombe*)

3.4. Mother or father of a child under five (5) years old

At the population level, 113 interviewed fathers or mothers (20.58%) were made aware of the pre-referral intervention, and 87.43% of the population accepted the strategy.

3.4.1 Socio-demographic characteristics of the parents

A total of 594 mothers or fathers were included in our study sample, of which 513 were female (86.36%) and 81 male (13.64%), with an mean age of 33±11 (mean ± SD) years, and half of them were farmers (66%).

The average distance between their home and the nearest health centre (min; max) was 4 km (0; 60) and the average time to reach the health centre (min; max) was 55 minutes (0; 1300). Almost half of the respondents had attended primary school (40.47%).

Table 24: Socio-demographic characteristics of the study population

Variables		Staff* (n=594)	Per-centage (%)
Gender	Female	513	86.36
	Male	81	13.64
Occupation	Other	54	9.11
	Shop keeper	52	8.77
	Farmer	393	66.27
	Housewife	88	14.67
	Civil servant	7	1.18
Education	Illiterate	133	22.39
	Only knows to read and write	7	1.18
	Primary	241	40.47
	Lower secondary	159	26.77
	Higher secondary	49	8.25
	Higher education (university)	5	0.84
Number of dependent children	1 to 5	489	82.32
	6 to 10	87	14.65
	11 and above	18	3.03

*sometimes staff has not responded

3.4.2 Knowledge about malaria

Almost all respondents (97.29%) declared having heard of malaria, and the most commonly mentioned signs were fever (95.23%) and vomiting (48.55%).

Most respondent (94.93%) declared that malaria is classified as one of the most serious diseases.

Table 25: Knowledge of the population about malaria

Variables		Staff* (n=594)	Per-centage (%)
Having heard malaria	Yes	575	97.29
	No	16	2.71
Malaria classified as one of the most serious diseases	Yes	562	94.93
	No	30	5.07
Fever mentioned as a sign of malaria	Yes	559	95.23
	No	28	4.77
Vomiting mentioned as a sign of malaria	Yes	285	48.55
	No	302	51.55
Diarrhea mentioned as a sign of malaria	Yes	121	20.61
	No	466	79.39

*sometimes staff has not responded

3.4.3 Treatment pathway and perception of pre-referral treatment

Over half the surveyed fathers or mothers said that they do not go to CHWs (53%) but that they go directly to the healthcare provider (87.35%).

Almost all of those who went to a CHW (80.59%) said he/she had given them a clear explanation on the treatment.

In addition, less than half the surveyed fathers or mothers (43.67%) said they had not received a referral slip to go to the health centre, and most (79.42%) said the CHW had not informed them on the ARC.

Table 26: Practices of fathers or mothers with a sick child under 5

Variables		Staff* (n=594)	Per- centage (%)
Self-medication	Yes	171	28.84
	No	422	71.16
Went to a CHW	Yes	277	46.71
	No	316	53.29
Went to a healthcare provider	Yes	518	87.35
	No	75	12.65
Went to a traditional practitioner	Yes	53	8.94
	No	540	91.06
Fever mentioned as reason for CHW consultation	Yes	354	85.51
	No	60	14.49
Result communicated by the CHW	Yes	320	84.66
	No	58	15.34
Treatment explained by the CHW	Yes	299	80.59
	No	72	19.41
Oral treatment received	Yes	328	92.13
	No	28	7.87
Artesunate rectal capsule received	Yes	15	4.21
	No	341	95.79
Referral slip to a basic health centre (CSB) received	Yes	178	56.33
	No	138	43.67
Recommendation by the CHW to go to the CSB	Yes	263	81.93
	No	58	18.07
Recommendation by the CHW to return to him after treatment at the CSB	Yes	320	68.97
	No	99	31.03
Information about malaria given by the CHW	Yes	446	81.09
	No	104	18.91
Information on ARC given by the CHW	Yes	113	20.58
	No	436	79.42
Acceptance of ARC	Yes	480	87.43
	No	69	12.57

*sometimes staff has not responded

However, almost all those surveyed (87.43%) declared having accepted the ARC treatment. In the region of Atsimo Atsinana, 47 respondents (51.09%) did not accept ARC.

Table 27: ARC acceptance based on the regions

Region		Staff* (n=594)	Per-centage (%)
Alaotra Mangoro	Yes	103	97.17
	No	3	2.83
Androy	Yes	141	95.92
	No	6	4.08
Anosy	Yes	17	100
	No	0	0
Atsimo Atsinanana	Yes	45	48.91
	No	47	51.09
Betsiboka	Yes	30	85.71
	No	5	14.29
Boeny	Yes	68	89.47
	No	8	10.53
Bongolava	Yes	45	100
	No	0	0
Ihorombe	Yes	30	100
	No	0	0

*sometimes staff has not responded

There is a statistically significant relationship between the population’s awareness about ARC and acceptance of its use ($p=0.032$), between the CHW’s explanation of the treatment and acceptance of the use of ARC ($p=0.001$), and between the educational level of mothers and/or fathers and acceptance of the use of ARC ($p=0.001$).

Raising the population’s awareness about ARC, CHW explanation of the treatment, and the educational level of mothers/fathers of children under 5 all influence the acceptance of ARC treatment, and these differences are statistically significant.

Table 28: Factors influencing acceptance of ARC use

Variable	Acceptance of ARC		p
	Yes	No	
Raising awareness about ARC			0.032*
Yes	92	48	
No	386	386	
Explanation of treatment by the CHW			0.001*
Yes	242	56	
No	69	2	
Education			0.001*
Illiterate		6	115
Knows only to read and write		2	5
Primary		32	194
Lower secondary		2	5
Higher secondary		1	42
Higher education (university)		0	5

*Significant difference

3.4.4 Parents' perception of the strategy

The interviews of parents did not really provide direct information on their perception of the ARC programme activities. This is mainly due to the fact that the parents had no particular experience of its use. However, their comments helped us understand the mechanisms and factors that could promote or hinder the implementation of the ARC programme.

3.4.4.1 Factors that can positively influence the ARC programme

a) Good knowledge about malaria and its perception as a potentially severe disease especially in young children

Malaria is generally fairly well known by the population. An unclean environment, mosquito bites and the non-use of mosquito nets were among the other factors mentioned by the interviewees to explain its causes. Regarding symptoms, parents did not really know how to differentiate uncomplicated and severe malaria, but they understood that certain symptoms are serious. In their eyes, if a child only has fever and chills, malaria can be treated on an outpatient basis by CHWs, whereas if more alarming symptoms are present (vomiting, diarrhea, seizures...), the child must go to the health centre to receive an intravenous treatment. Parents consider that those signs are serious and that the child could die if he/she did not receive a treatment urgently.

This knowledge about severe malaria is an asset for the success of the malaria control policy and the implementation of the ARC programme.

“ For uncomplicated malaria, drugs at Mrs. Ginah’s (the village’s CHW) can do the trick. On the other hand, if it’s very serious and the patient is very weak, vomits and cannot stand upright, we will go to the hospital. That’s all I know about it, but it’s really very serious, isn’t it? When you can’t stand up, the tablets don’t work anymore, so we leave.”
(Mother, Ambatoboeny)

“ For me, malaria is the most dangerous because people who catch it and are not taken to the doctor within two days will not recover. But if the doctor takes care of them early, the day after they arrive they will be put on a drip. I took one of my children to the doctor and they gave him eight bags of fluid. And this cost me 117,000 Ariary for eight bags.” (Father, Bekily)

“ For me, uncomplicated malaria is when a person perspires, that is uncomplicated, but when the person vomits or has seizures, then it’s severe malaria.” (Father, Farafangana)

b) Trust and positive perception of modern medicine and healthcare providers, particularly for the management of diseases in children under 5

Interviewed parents had a relatively positive perception of healthcare providers working with western medicine. These healthcare providers were considered to be the best placed to meet healthcare needs. This opinion was even more pronounced when it came to young children diseases. Therefore, prescriptions and advice from caregivers are never questioned and special attention is given to them. Even if the parents said that they had never heard of pre-referral ARC for malaria, they all mentioned that this drug deserves to be considered because it is the doctor, the modern doctor, who recommends its use. This positive perception of modern medicine, combined with a good knowledge of malaria and its potential dangers, is a winning combination for the implementation of the malaria control policy and the ARC programme, as their success is above all conditioned by the feeling and the need of the population to call upon CHWs and caregivers for malaria.

“ I don’t see why it wouldn’t suit me, because if I take them (my children) to the health centre, it’s because I myself don’t know how to treat them. So if there’s a drug that can be used, well it suits me because it will cure my child. I always take my child to the hospital.” (Father, Farafangana)

“ No, a child of his age cannot be self-medicated. Personally, whenever my son gets ill I bring him here directly. Once I took him to the Clinique Saint Jean to be operated because he felt some pain in both his testicles. However, instead of surgery, the professor prescribed multivitamins because, according to him, what was happening to my son was normal.”
(Mother, Fenoarivobe)

“ I have no idea what they might think. I think that if the doctor prescribed it, it was certainly the effective way to treat a disease. That’s my opinion, but I don’t know what the others might think.”
(Father, Bekily)

“ If healthcare providers considers it (ARC) to be necessary, then I don’t see any problem because it is to save lives.” (Father, Fenoarivobe)

c) A good and trusting relationship between parents and CHWs

One of the ways to increase the effectiveness of the ARC programme is to promote the representation of CHWs as individuals who are worthy of being consulted and listened to. Some parents, particularly those living far from health facilities, reported that they were accustomed to consulting the village's CHW for a health problem. This habit can be explained, among others, by the trust placed in them or simply by their proximity to the parents' home, which reduces the difficulties involved in travelling to the health centre. Another positive factor often mentioned was the good relationship between parents and CHWs, especially if they live in the same community.

“ I like to go to the health centre, but because of the distance, we make do with CHWs [...] My husband always works far away from our village and I have no one to look after my children. Any there is also the expense of travelling to Manantenina (where the Basic Health Centre is located), all of which make me decide to choose the CHW.” (Mother, Taolagnaro)

“ [...] we go to the CHW as soon as possible when we are ill, especially on Sundays when the CSB 2 is closed.” (Mother, Ihosy)

“ We go to the CHW when we are sick. We go there because the CSB is very far away, it's almost 15 km from here [...]. We went to the CHW when we noticed that our child wasn't well, he had a strong fever. I gave him paracetamol quickly to alleviate the fever. The CHW tested my child and he had malaria. He gave us three medicines to take for three days” (Father, Taolagnaro)

d) Suppositories: a galenic presentation acceptable to the population's culture and individual logic and sometimes even preferred over other drug presentations

For the interviewees, the best-known drug administration routes are the oral and parenteral routes. The intrarectal route was mentioned only very rarely. The surveyors often had to explain to the participants what was the intrarectal route, and then the participants remembered having used suppositories in the past. After this reminder, the parents said that they had no problems with intrarectal drugs. Some people even considered this route of administration to be much more convenient for various reasons. Particularly for children who are afraid of injections or for whom oral administration can be difficult. Parents are often keen on suppositories to treat their children.

Furthermore, for some individuals in the southern part of the country where culture forbids injections with metal objects in the body, suppositories are considered as possible 'alternatives' to injections. Admittedly, this does not take into account the fact that ARC is only a pre-referral intervention, and the child will be given parenteral drugs upon his/her arrival at the health centre. Nevertheless, this is interesting angle that could help healthcare delivery.

“ I think that suppositories are more effective, especially for children, since these drugs are not likely to be rejected by the child, and children are also afraid of injections. I think this is the best way to administer drugs to children.” (Father, Fenoarivobe)

“ For artesunate injection? The problem so far in our region is that there are people who still stick to our traditions. For instance they refuse injections. You can't give them an injection because of their culture [...]. Artesunate rectal capsules should be effective because I believe these people will appreciate its advantages.” (CSB Head Physician - Tsihombe, South Region of Madagascar)

“ Compared to other drugs, in my opinion, suppositories can act faster. They can cure diseases, suppositories act faster to my knowledge.” (Mother, Ihosy)

“ I prefer suppositories to other drugs, such as pills for instance that are difficult to administer.” (Mother, Fenoarivobe)

3.4.4.2 Potential scale-up challenges for the ARC programme

In addition to these opportunities that could have a positive impact on the ARC programme, parents' interviews highlighted some potential problems that should be addressed to improve the programme's effectiveness.

a) Misconceptions about the ARC programme

The biggest challenge remains the population's misconceptions about the pre-referral administration of ARC for severe malaria. All the interviewees said that they were not aware of this intervention for the management of severe malaria. This is understandable given that the programme itself is still in its start-up phase and the products are not yet available in all community sites. However, such misconceptions could compromise the scaling up of the programme if they persist during the implementation phase. Nevertheless, this gap could be easily filled by providing information about malaria to the population and by considering modern medicine as the reference for young children diseases.

“ It is the first time I hear of this drug. I had never heard of it before, not even how it's used. Yes, this is the first time. I'm going to talk about it with my friends. I'm going to tell them about your survey. I'm going to tell them about the efficacy of this drug. When it becomes available, we need to get some.” (Father, Tsihombe)

“ I have never heard of a drug being administered in the rectum, no child has ever received that here. [...] The CHW tells us only about hygiene, the need to go to the CSB in case of illness, the vitamins to give to children when they are... what age was it?” (Mother, Farafangana)

b) Financial difficulties and geographical remoteness

The interviewees often mentioned financial difficulties and geographical remoteness as limiting their access to the health centre. Besides the cost of drugs, which is perceived to exceed the purchasing power of households, the expenses linked to travelling and staying at the health centre are also dissuasive. Some parents prefer not to go to the health centre simply for fear of not being able to pay for the medical care. The scaling up of the ARC programme should always take into account households' economic and geographical constraints. Health facilities are the last stage in the management of severe malaria, so in spite of the fact that ARC is free of charge at community sites, their inaccessibility could jeopardise the whole programme.

“ The first problem is that the health centre is very far. The second problem is that we don't have a car or a motorbike to take patients to the hospital. We have access to a cart, but we have to pay 20 000 or 30 000 Ariary to take it to the centre. That is a major problem for us.” (Father, Tsihombe)

“ The difficulty is life itself. Sometimes we have to wait because the doctor doesn't treat for free, we always have to pay him. And even a curable disease can become fatal. So we just sit and wait. We wait for the Lord to cure us and we pray: “Lord, forgive us! Lord, save us!” When the Lord helps, we are cured. If Satan takes His place, Satan takes us away.” (Mother, Bekily)

“ But the problem is that we don't have any money. Diseases come without warning and we don't have money for that. That is the problem for me.” (Mother, Tsihombe)

c) A negative opinion of CHWs and their services

Some interviewed parents had a poor opinion of the CHWs and their services. The main reason given was their limited capacity to deal with some of the diseases due to the lack of equipment and drugs. Therefore, they prefer to go to healthcare providers in healthcare facilities. This situation could jeopardise the ARC programme and should be addressed, as CHWs are the main actors involved in the use of ARC.

“ We don't go to the CHW because he doesn't have enough drugs, so the child won't be cured [...]. I have never been to the CHW. There is a difference between going to CHW and going to the Health Centre. The drugs you get are not the same.” (Mother, Farafangana)

“ Our Pastor's son had fallen ill. Someone told him to take him to the CHW for consultation, but when they got there, he did nothing for the child. So there you are.” (Mother, Marovoay)

4. Discussion – Recommendations

4.1. Discussion

Based on the analysis of the data generated by the process indicators, it is clear that the implementation of the programme is not effective, hampered by a poor reporting system mentioned in most technical reports, and the unavailability of inputs. Poor governance, palpable at all the levels necessary to drive change, prevents reaching the optimal performance that would be appreciated by the population. It should be pointed out that implementation guidelines have been drawn up for the ARC strategy and that they are available to stakeholders, but they are insufficiently applied for various reasons. For 25% of healthcare providers at regional and district levels, the system does not function properly, even though most interviewees were familiar with it, except at the population level.

The major problem lies in the execution of planned activities during the training, and in the application thereafter of the knowledge received.

Even if 100% of planned activities were reportedly carried out, the survey provided a radically different picture, highlighting significant discrepancies. Differences were recorded on 4 levels:

i. Training reach

- 10% of regional and district officials and 26% of CSB officials stated that there was a difference between the number of training sessions planned and those carried out.
- According to 29% of CSB healthcare providers, the planned number of CHWs to be trained has not been met.

ii. Doses delivered

Only 4% of EMAD and EMAR personnel were not given any training on ARC and 3% did not participate in the training of CSB healthcare providers. However, 28.92% of CSB healthcare providers did not receive training on ARC and 39.29% did not participate in the training of CHWs on ARC. At the community level, 29.24% of interviewed CHWs had not received any form of training on ARC.

Regarding input availability at every level of the health system and the procurement mechanism, it is clear that the system is failing at all levels, and that an effective and sustainable availability of inputs at all levels is dependent on external budgetary aid. Nevertheless, the existence of expired inputs, in particular ARC, leads to poor governance at all levels and to a supply failure.

At regional and district levels, 3.23% of centres were out of stock of RDTs, and 38.71% were out of stock of ARC. At the CSB level, 3% of the interviewees had no RDTs available to confirm severe malaria cases. In addition, 66.67% had no ARC and 44.44% had never received any ARC. Furthermore, 57.06% of CHWs had no RDTs, 59.88% had no ARC tools, 49.59% had no referral and counter-referral slips, and 83.04% were out of stock of ARC, while all these tools are essential to guarantee the effectiveness of the pre-referral intervention.

Almost all the population knew about malaria and its severe clinical presentations. ARC acceptance by parents depends on the quality of the relationship between the healthcare provider and the parent. Healthcare providers need to make sure, in an almost anthropological and person-centred way, that the information, the situation and the health problem have been clearly and fully understood by the parents if their health needs are to be met. However, only 20.58% of the strategy's beneficiaries received explanations on the pre-referral intervention. Also, despite the existence of the community health system, 53.29% of the parents refused to take their child to it. In fact, 87.35% of the parents took their child directly to a healthcare facility. However, 87.43% of the population accepted the strategy. This positive response from parents is an asset for the implementation of ARC.

iii. Knowledge of stakeholders and application of the training received

Regarding the knowledge, attitudes and practices of CHWs and healthcare providers around malaria control, and particularly the use of artesunate rectal capsule, almost all CHWs and healthcare providers were relatively familiar with the product, but poor understanding of its use, particularly by CHWs, is undeniable.

From the regional to the community level, all stakeholders complained about the lack of product (ARC) needed for practical exercises during training sessions.

The study showed that 96.43% of interviewed healthcare providers at regional and district levels said that CHWs were already using ARC for the pre-referral intervention in children under 5.

The study also showed that 14.46% of CSB healthcare providers were not even aware of the strategy, even though they were all supposed to have received a training and to have trained CHWs. These healthcare providers were also unable to confirm the use by CHWs of ARC as a pre-referral intervention. Furthermore, 12.99% of the healthcare providers said that artesunate rectal capsule is designed to treat severe malaria at the CSB.

Regarding CHWs' knowledge of the intervention, 87.68% mentioned that the patient's referral to the CSB after a prescription of artesunate rectal capsule is a step in the management of severe malaria in children. However, 73.73% of the CHWs had not used ARC in a child with severe malaria, and 95.79% of the parents said that their child had never received ARC.

iv. Fidelity

As previously stated, there was a significant gap between what had been planned and what was achieved. This anomaly mainly concerns the administration of training, as the lack of teaching tools prevented some of the healthcare providers from being trained. The majority of CHWs did not have the management tools and inputs needed to follow the protocol or the steps required to manage severe malaria cases. There was little awareness among the population, even though most of them adhered to the strategy.

The programme's implementation is positively and negatively affected by various factors. The factors selected in the model as being associated with the community's acceptance of the ARC programme include the community's awareness of the programme, as well as clear explanations of the treatment using a person-centred and personalised approach to meet the demands of the parents. The most important factor promoting ARC implementation is a comprehensive and adequate training of all public health and community actors. The obstacles to ARC implementation include mainly the unavailability of

inputs, particularly of artesunate rectal capsule, and the non-application of the IMCI strategy, which was reported as non-functional in most of the intervention teams' technical reports. Artesunate rectal capsule is only periodically available, based on whether a training session on the product had been given or not. In other words, the system is failing completely in terms of funding and logistics, and the only option for CSB Heads is to attend a training session at the district or regional level to receive stocks of ARC.

Most comments regarding training and materials were relevant and praising, whereas working and management tools were lacking in most community sites, and at the region and district levels.

4.2. Recommendations

This study generated a few recommendations based on the level of intervention.

4.2.1 National Malaria Control Programme

- ⦿ Committing to guarantee the availability of ARC programme inputs;
- ⦿ Re-kindling and awakening a sense of patriotism, ethical awareness and humanity among all public health actors at all levels, to promote a holistic approach to health problems for individual and common well-being;
- ⦿ Mobilising technical and financial partners to guarantee the availability of working and management tools;
- ⦿ Improving scientific analysis and use of existing data to increase the system's overall reactivity and resilience.

4.2.2 EMAD and EMAR personnel

- ⦿ Improving reporting at central level, as well as monitoring/supervision of the programme at community level, using a more systemic approach focusing on a community-based approach to health problems;
- ⦿ Carrying out the necessary daily activities, including ordering and logistics, to guarantee a minimum of effective and efficient involvement with a common charitable aim;
- ⦿ Stimulating the implementation of the Integrated Management of Childhood Illnesses (IMCI).

4.2.3 Healthcare providers in CSBs

- ⦿ Improving the supervision of CHW activities using an integrated approach to generate reports on the distribution and use by the CHWs of artesunate rectal capsule in particular, and analysing the healthcare providers' activity reports relating to the programme;
- ⦿ Improving periodic reporting from community sites to the Public Health District Service;
- ⦿ Optimising the community approach for effective community participation with a view to achieve self-management of their own health.

5. Conclusions

Even in its pilot phase, the ARC programme is an asset in the fight against malaria. Its implementation requires further strategic adjustments based on the various recommendations made by the stakeholders. This study should enable the programme to improve its ARC interventions so as to achieve its objective of reducing malaria mortality at the community level.

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Appendices

APPENDIX 1: Photos of data collectors training



APPENDIX 2: Flyers used during ARC implementation

ARTESUNATE ASISIKA

Ho an'ny zaza 6 volana ka hatramin'ny 59 volana

FISY TEKNIKA HO AN'NY MPANENTANA ARA-PHASALAMANA

INONA NO ATAO HOE TAZOMOKA MAHERIVAIKA?
 TAZOMOKA MAHERIVAIKA : nafana na mafana hoditra, FITD poaitra ny fitiliana natao, ahitana iray amin'ireto fambara loza ireto: tay afaka misotro rano na minono, mandao izay rehetra ateliny, nifanintona na mifanintona, na loza tay maharany tena na tay mahatsiaro tena na herjana ny hatoka
 - Ny zaza no mahaiza voan'ny tazomoka maherivaika noho ny hery fahaviana tay amin'ny tena na tay misy ao aminy.
 - Mahabaly ny tazomoka maherivaika raha tay misy fitsaboana haingana sy safaha.

INONA NO ATAO HOE ARTESUNATE ASISIKA ARY RAHOVIANA NO AMPIASANA AZY?
 NY ARTESUNATE ASISIKA dia:
 - fanafody atofotika ny iray-tian'ny zaza 6 volana ka hatramin'ny 59 volana voan'ny tazomoka maherivaika alohan'ny handefasana azy any amin'ny CSB hatrany ny fitsaboana safaha.
 - omena araka ny lantana na taona.

DINGANA ARAHINA

*Araka ny CMS tay volaforin'ny taona fanany antany

AHOANA NY FAMPIASANA NY ARTESUNATE ASISIKA?

MISY DINGANA DIMY

> Dingana voalohany: Fiomarana

1. Hamaritry ny taona na ny lantany ny zaza
2. Hamaritry ny fitra safaha ny zaza araka ny lantany na ny lantany
3. Sasas amin'ny nana ny lantany ny taona
4. Ampiro ny ara-tanana
5. Omani ny zaza marany
6. Ampiroko mihoriana ao ambonin'ny fita ny nana ny zaza

Taona	Lantany ny zaza	Fatra: 10mg/kg
6 volana ka hatramin'ny 3 taona	5 kg ka hatramin'ny 14 kg	siposona 1 (1 x 100mg)
3 taona ka hatramin'ny 6 taona	14 kg ka hatramin'ny 20 kg	siposona 2 (2 x 100mg)

MINISTERAN'NY FAHASALAMAM-BAHOAKA

Raha nafana na mafana hoditra ny zanaka
ka ahitana ny iray amin'ireto fambara loza ireto:

Tay maharany tena na Tay mahatsiaro tena
 Tay afaka misotro rano na minono
 Mandao izay rehetra ateliny
 Nifanintona na Mifanintona na Mihanjina ny hatoka

DINGANA 1:
 Manatona haingana Mpanentana ara-pahasalamana na CSB hanaovana fitiliana ny zaza

Raha hita fa tazomoka mahery vaika no mahazo ny zanaka dia ampidirana "artesunate" asisika avy hatrany

DINGANA 2:
 Mandehana avy hatrany eny amin'ny CSB avy eo hahazoana fitsaboana safaha ny aretina

AZA MANGATAKA ANDRO
 Tandindomin-doza ny ain'ny zanaka!

Tazomoka maherivaika

eo amin'ny zaza 6 volana ka hatramin'ny 59 volana

Fanontaniana:
 1-Inona no hitantsika amin'ny sary?
 2-Inona ny hafatra tian'ny sary hampitaina?

Zaza marany antoa mamory Mpanentana ara-pahasalamana. Zaza avy amin'ny ARTESUNATE asisika

FANAMPIM-PANAZAVANA

NY TAZOMOKA MAHERIVAIKA, nafana na mafana hoditra, natao fitiliana na FITD poaitra, ahitana ny iray amin'ireto fambara loza ireto: tay afaka misotro rano na minono, mandao izay rehetra ateliny, nifanintona mandritra oza amin'ny hatoka, mifanintona tena, tay maharany tena na tay mahatsiaro tena na herjana ny hatoka
 - Ny zaza no mahaiza voan'ny tazomoka maherivaika noho ny hery fahaviana tay amin'ny tena na tay misy ao aminy.
 - Mahabaly ny tazomoka maherivaika raha tay misy fitsaboana haingana sy safaha.

Katofane
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APPENDIX 3: Photos taken during data collection







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