Annals of Malaria Research

Research Article
Published: 26 Mar, 2019

National Strategy for Malaria Elimination in Cape Verde in 2020 Horizon

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Abstract

Malaria continues to be a major public health problem in tropical and subtropical countries. Reduction in morbidity and mortality cases had been reported from 2010 to 2017 in the worldwide. The World Health Organization identified 21 countries with the potential to eliminate malaria by the year 2020, once is Cabo Verde. In the country malaria is instable, with sporadic seasonal transmission variable from year to year and related with the rainy season. From 2010-2016, most of the archipelago malaria cases were imported from African countries and indigenous cases was restricted to Boavista and Santiago islands, especially in Praia, capital city. The outbreak in 2017, with 423 indigenous cases put to the test the weaknesses of the country in the elimination process. Although the feebleness and challenges the country appears that the is one of the best candidates to achieve elimination in the 2020 horizons in the West Africa subregion. This paper presents the Malaria Elimination Strategy in Cape Verde in 2020 horizon, with the principal domains and interventions in the country.

Keywords: Malaria elimination; Cabo Verde; Strategies

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Received Date: *01 Feb 2019*
Accepted Date: *22 Mar 2019*
Published Date: *26 Mar 2019*

Citation:
de Pina AJ, Moreira AL, Correia AJ, Furtado UD, Seck I, Faye O, et al. National Strategy for Malaria Elimination in Cape Verde in 2020 Horizon. Ann Malar Res. 2019; 1(1): 1002.

Introduction

Despite being a preventable and curable disease, malaria remains a major public health problem, translating a huge burden globally. In according with the World Health Organization (WHO) report 2018, was estimated 219 million cases of malaria occurred worldwide, with 92% in Africa, where fifteen countries and India carried almost 80% of the global burden. In the same region, five countries accounted for nearly half of all malaria cases worldwide, being Nigeria (25%), Democratic Republic of the Congo (11%), Mozambique (5%), India (4%) and Uganda (4%). Malaria related with *Plasmodium falciparum* continues to be the most prevalent in Africa, responsible for 99.7% of estimated malaria cases in 2017, 62.8% in South-East Asia 69% in Eastern Mediterranean and 71.9% in the Western Pacific (71.9%). In the other hand, *P. vivax* is the predominant parasite in the America, representing 74.1% of malaria cases [1].

Malaria elimination is a widening, with more countries moving towards zero indigenous cases. In 2017, 46 countries reported fewer than 10.000 such cases and the number of countries with less than 100 indigenous, increased from 15 countries in 2010 to 26 countries. Paraguay and Uzbekistan was certified by WHO as malaria free in 2018, while Algeria and Argentina has made formal requests to WHO for certification and China and El Salvador reported zero indigenous cases [1,2].

One of the key Global Technical Strategy (GTS) milestones for 2020 is elimination of malaria in at least 10 countries that were malaria endemic in 2015 and once of this country is Cabo Verde [3].

The WHO defines the elimination of malaria as interruption of local transmission (reduction to zero incidences of indigenous cases) of a specified malaria parasite species in a defined geographical area as a result of deliberate activities. For a country, the elimination of the disease is the ultimate goal

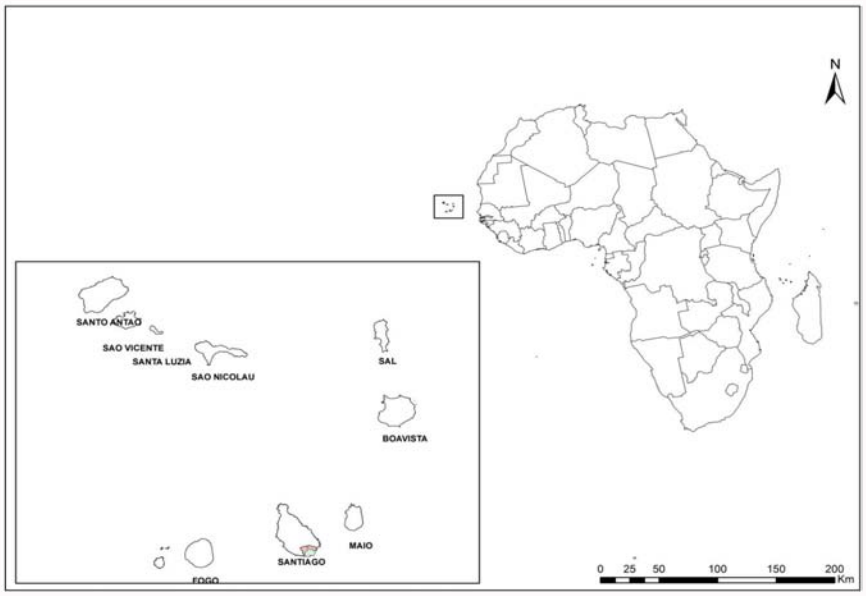

Figure 1: Localisation of Cabo Verde islands.

of the fight against malaria. However, after disposal, it is important to continue to implement appropriate interventions to avoid reintroduction of transmission. Continued political commitment, sufficient resources and effective partnerships are necessary for the success of malaria elimination programs [4].

A country acquires malaria-free status in four distinct programmatic phases [4]: control, pre-elimination phase, elimination and prevention of reintroduction of the disease. Each phase is defined by a set of programmatic interventions required for prevention, treatment, monitoring, monitoring and evaluation, and for strengthening health systems. The change from one status to another is determined by a series of programmatic and epidemiological criteria, and countries may choose to adopt a phase-out strategy, either by species of parasites or by geographical area.

Following the African Union's Malaria Elimination Campaign launched in 2007 [5], recent commitments from funding partners, such as Bill & Melinda Gates, and WHO's priority to eradicate malaria, African countries have reoriented their programs to fight against malaria, setting targets for the elimination of indigenous malaria cases in contexts appropriate to their respective situations.

In this context, WHO promotes malaria elimination efforts, where appropriate, based on country-specific contextual factors, including, meet the epidemiological criteria of low malaria burden; Located near the natural limits of the disease; whose main authorities commit themselves politically and financially to achieving the elimination goal; whose health systems and surveillance capacity are sufficient to carry out an elimination program; and/or where the species of parasites and vectors, as well as the technical aspects, allow the elimination [4].

In order to limit the period of intensive field operations as quickly as possible, malaria elimination is generally carried out as a limited time program. Even under optimal operating conditions, a period of at least 8 to 10 years is needed to eliminate the disease in an area where the transmission persists. The importation of malaria by international travellers presents a risk of resumption of transmission, as well as the decline in political support for malaria control, which is often observed when a program is successful.

Cabo Verde is a country in a pre-elimination malaria step since the 1990 year [6], regarding the reported cases, with incidence <1 case/1000 inhabitants. However, there are several challenges to be overcome and policies to be adapted to achieve elimination by 2020 horizons in the country.

Methods

This document is a compilation of the WHO recommendations of policies and strategies proposed to Cabo Verde to achieve the malaria elimination in the 2020 horizons. A review of the principal guidance documents was used, and with the support from WHO experts to the country, a strategic document was prepared.

Malaria control in Cabo Verde towards elimination

Cape Verde is an archipelagic country located about 450 km west of the African coast west of Dakar, Senegal, occupies an area of 4033 km² and an exclusive economic zone of 700,000 km², located between the parallels 17° 12' and 14° 48' north latitude and meridians 22° 44' and 25° 22' west longitude. It consists of ten islands, nine of which are inhabited and several islets, divided into two groups called Barlavento, to the north and Sotavento to the south, according to the position they occupy in relation to the dominant north-easterly wind (Figure 1).

Figure 1 - Localization of Cabo Verde Islands

Malaria has been introduced in Cape Verde in the 16th century at the time of the settlement of the islands in 1462 by migrants from Africa (including North Africa), Spain, Italy and Portugal. These occurred in the years when it rained more abundantly or when individuals came from highly endemic regions in Africa such as S. Tomé and Príncipe, Angola or Guiné-Bissau [7].

Actually, the country is categorized in the pre-elimination phase by the WHO, with substantially reduced the malaria burden between 2001 and 2015, from 115 cases to 27 cases, only seven of which were indigenous in 2017. Unfortunately, in 2016 the cases number

increased to 75 cases (48 indigenous) and an outbreak in 2017, caused 446 cases, being 423 indigenous [6,8]. While *P. Vivax* and *P. malariae* transmission is possible in Cape Verde, no cases have been reported since 1994, with exception of one *P. vivax* case imported from Brazil in 2018 [8]. *Anopheles arabiensis*, member of the *Anopheles gambiae complex*, has been the only vector responsible for malaria transmission reported in the country [9-15]. Although some doubts have been raised as to the geographic distribution of this vector. If one-way an update species distribution of the Mosquito fauna on the Cape Verde Islands (West Africa) indicate its distribution in all island, except Santo Antão e São Vicente, [10] in the other hand the case study, moving towards sustainable elimination in Cape Verde [15] generalize the species distribution to the islands except Sal and Brava, what emphasize the need for additional vector studies in the country.

The changes in temperature and rainfall regime that may occur can lead to greater abundance and dissemination of vectors and pathogens [16], especially the malaria burden in Africa [16-20]. And Cabo Verde, a West Africa country in malaria elimination process, the effects of weather and climate changes can compromise this goal if concrete measures are not doses and accounted [21]. Namely the possibility of changing the behavior of vectors, mainly due to climate change, issues related to the emergence of resistance to insecticides, among others, are challenges that the country in the process of permanent and integrated monitoring of vector. Others factors as the movement of people to and from endemic areas, the increasing internal mobility, weak population immunity and others issues need to be in account in the process elimination in the country.

The entire Cape Verdean population is at risk of contracting malaria. Based on the epidemiological classification established, 57% of the Cape Verdean population live in islands with vector and with local transmission (Santiago and Boavista), 36% in islands with vector and without local transmission (Santo Antão, São Vicente, Sao Nicolau, Maio and Fogo) and 7% in islands without vector and without transmission (Sal and Brava) [15,21]. In addition to the poor immunity of the population, the dynamics of the country's internal mobility, the movement of people from other endemic countries, among other factors, causes the entire population to be considered a risk of malaria transmission [21].

The National Malaria Control Program (NMCP) was created in 1988, formerly as the Brigade to Fight Malaria and culicidae vectors. Actually, it is part of an Integrated Program to combat vector-borne diseases and health problems associated with the Environment. Prior to 2009, a number of action plans were drawn up and implemented without focusing on the elimination of malaria. In 2009, the NMCP prepared a National Strategic Plan for Pre-elimination of malaria for the period 2009-2013, whose objective is to reduce the incidence in less than 1 case per thousand inhabitants [22]. In 2013, the Performance of the Program was revised with the objective of updating the normative and strategic documents, and in the end of 2018, a new review started with the aim to elaborate the new strategic plan for malaria elimination in Cabo Verde 2019-2023.

In the context of malaria elimination in the country, the NMCP elaborated the national strategy for malaria elimination in the country, a document that provides guidance on the tools, activities and strategies that will support the adoption and implementation of the policy guidance by national malaria control programme, to achieve malaria elimination in the 2020 horizon.

Objectives and priorities of the elimination strategy

In line with the political commitment of the highest national authorities to eliminate malaria by 2020 in Cape Verde, the objectives and priorities of the National Strategy are presented below.

- Objectives of the national malaria elimination strategy:Eliminate local transmissions of malaria
- Eliminate outbreaks of malaria infection
- Prevention of malaria reintroduction

National priorities for malaria elimination:

- Strengthening of program management and coordination capacities in the context of malaria elimination;
- Strengthening the capacity for biological diagnosis of malaria and laboratory quality assurance in all health facilities;
- Immediate notification of cases, investigation, classification and monitoring of all malaria cases diagnosed as confirmed outbreaks of malaria cases;
- Early and effective treatment of all cases of malaria confirmed with the introduction of anti-gametocitaries;
- Implementation of vector control interventions with the identification and monitoring of breeding sites in the active foci;
- Reduction of the risk of propagation of parasites and vectors in the country;
- Documentation and implementation of procedures for certification of the elimination of malaria with central and intermediate databases.
- Regional and/or sub-regional collaboration.

Guidelines national policy on the elimination of malaria

The vision of NMCP, "For a Cape Verdean Malaria-free", is inspired by the National Health Policy and the various global elimination commitments approved by the Government [22]. The elimination of malaria in Cape Verde should be progressively implemented with the strategies tailored to each country's stratum to achieve the desired results along the path of elimination [15,21].

Period 2014-2016:

- Eliminate local transmission of malaria, in the Extract 1, islands with vector and with local transmission (Santiago and Boavista islands), with 57% of the population;
- Eliminating outbreaks of malaria infection, extract 2, islands with vector and without local transmission, being Santo Antão, São Vicente, São Nicolau, Maio and Fogo, with 36% of population, and,
- Prevention of reintroduction of malaria, extract 3, islands without vector and no local transmission, with 7% of population, being Sal and Brava.

Period 2017-2020:

- Eliminating outbreaks of malaria infection in the Extract 1;
- Prevention of reintroduction of malaria in the extracts 2 and 3;

Period 2021-2023:

- Prevention of reintroduction of malaria in the country, in

the extracts 1, 2 and 3;

- Certification before 2023;

Fundamentals, guiding principles and values: The Constitutional Law of the Republic of Cape Verde n. 1/V/99 of November 23 stipulates through Article 70 that the State guarantees to all citizens, among other rights, the right to health and the duty to defend and promote it, regardless of their economic condition [24]. Thus, the Government has a National Health Policy in which the elimination of malaria is a national design.

The National Malaria Elimination Strategy is based on universal principles and values such as equity, justice, social solidarity and universal access to malaria prevention and treatment services for all populations at risk.

National strategies for the elimination of malaria: According to the National Health Policy 2007-2020 [23], and given the very low incidence of indigenous cases recorded in the country between 2009 and 2016 less than 1 per 1000 inhabitants, the national authorities decided to move forward to maintain the program and implement effective strategies for the elimination of malaria in Cape Verde in 2020.

The strategies adopted are based on the WHO recommendations on elimination [4] and take into account the specificity of the epidemiological profile of malaria in Cape Verde.

In the context of malaria elimination, a well-functioning surveillance system for outbreaks of infection and disease should be implemented at all levels of the health system and at the community level. In order to detect all malaria infections (both symptomatic and non-symptomatic) and to ensure that they are treated radically early, surveillance systems should cover the entire country for as long as is necessary.

The malaria surveillance system should be carried out in accordance with the following two approaches: i) the passive surveillance should cover all symptomatic cases detected in the active transmission outbreaks through the presence of well-trained health personnel in public and private health services; and ii) the passive surveillance should always be preferred to periodic visits by mobile teams to active malaria outbreaks. Active surveillance should be considered complementary to passive surveillance for health staff to detect cases of malaria infection at community level and in households of population groups considered to be at high risk. Active case detection should always be done as part of epidemiological investigations of new cases of malaria and/or new outbreaks among family members or in individuals at risk or in the population of a detected outbreak, co-workers in an index case, subjects (foreign or not) of areas at risk of malaria, etc. A geo-referenced database, dedicated to malaria elimination, should be established to facilitate surveillance and reporting of malaria cases according to a dynamic classification for both confirmed cases and confirmed outbreaks of infection [25]. Similarly, a national registry of malaria cases and other outbreaks of infection should be implemented to organize information on the identification, treatment and surveillance of outbreaks of infections and potential outbreaks.

According to the country's national disease surveillance guidelines, including malaria, all public and private actors in the health sector must ensure compliance with the procedures defined by the Ministry of Health under the supervision of the Integrated Epidemiology and Epidemiology Response and in coordination with the NMCP, including:

- notification of any confirmed case of malaria within 24 hr;
- the investigation of any confirmed malaria case within 48 hr and its declaration;
- the investigation of active infectious outbreaks and the appropriate response within 7 days after the declaration of the case.

All reported malaria reports and case investigations should be archived by the NMCP and the different levels of the health system to serve as future references to documentation of the national certification process for the elimination of malaria in Cape Verde.

Universal access to effective malaria diagnosis and treatment: In the context of correct management of malaria cases, any patient suspected of malaria should be systematically tested and, if positive, treated with an effective antimalarial drug in public facilities. The National guidelines on parasitological diagnosis and specific malaria treatment (simple, severe, and therapeutic failure) at different levels of the health pyramid developed by the NMCP [24] should be regularly updated on the basis of current WHO recommendations. The specifications of TDRs used in the country should be established and updated periodically as part of the national list of antimalarial drugs and other antimalarial inputs adopted under current Ministry of Health procedures.

Parasitological diagnosis of malaria: According to the WHO recommendations, any suspected case of malaria seen in a health facility should be tested to confirm or refute the diagnosis of malaria [26,27]. All suspect cases confirmed parasitological by microscopy, Rapid Diagnostic Test (RDT) or Polymerase Chain Reaction (PCR) are considered as malaria cases.

The different methods of parasitological diagnosis (microscopy, RDT, PCR) should be used at all levels, depending on the technical platform of the level of sanitary structures. The microscopy should continue to be the gold standard in the context of malaria elimination to allow the identification of species of plasmodia and the monitoring of antimalarial cases based on the density of the parasite. RDT used for confirmation of malaria in health facilities without functional microscopy should remain and at the community level when investigating confirmed cases or screening a family in a transmission focus or group of travellers from an area at risk of malaria. PCR should be used according to specific situations, especially when cases of malaria become increasingly rare.

The quality assurance system shall be implemented in accordance with the procedures defined within the National Laboratory Network. Thus, a quality assurance program for microscopy and TDR should be established and cover all health facilities in the country (National Laboratory Network).

Parasitological quality controls, both internal and external, should be carried out regularly under the leadership of the NMCP and in collaboration with authorized reference structures (central laboratories, universities, international reference laboratories approved by WHO as collaborating centre's).

The antimalarial treatment should be in accordance with the form of malaria (simple, severe) and the level of the technical platform of the health structure in the case of severe malaria. All people with the malaria parasite (national or migrant) should be treated early with

effective antimalarial drugs to reduce transmission.

The treatment of simple malaria should be done with an effective antimalarial drug in public structures. This treatment should take into account the species of plasmodia. Cases of simple malaria confirmed to *P. falciparum* should systematically receive antimalarial treatment with combined oral Artemisinin-based Combination Therapy (ACT) at a single dose of 0.25 mg/kg primaquine for its anti-gametocytocidal action except in children under one year of age and pregnant. In this case, it is not necessary to dose the G6PD.

Each pregnant woman with simple malaria should receive antimalarial treatment with oral quinine during the first trimester of pregnancy and oral ACT from the second trimester.

The treatment of malaria by other species is to eliminate the parasitic forms in the blood and, in the case of *P. vivax* and *P. ovale*, it is also to eliminate the hypnozoites present in the liver (called radical cure), thus preventing recrudescence and relapse, should be done using Artemether + Lumefantrine or Artesunate + Amodiaquine - according to the posology for simple malaria by *P. falciparum*. By eliminating the hypnozoites of *P. vivax* and *P. ovale*, Primaquine may also be administered to the patient Primaxic 0.25 mg/kg body weight per day orally once daily for 14 days. In patients with G6PD deficiency, primaquine can be taken at a dose of 0.75 mg/kg body weight once a week for 8 weeks and for patients with severe forms of proven G6PD deficiency, primaquine is contraindicated.

For the treatment of malaria by other species, if it is difficult to identify the species, treatment should be as if it were simple *P. falciparum* malaria, respecting the contraindications of ACT and primaquine.

Regardless of whether the patient comes from a place with Chloroquine sensitive or resistant infections, treatment of adults and children with simple *P. vivax* malaria can be done with ACT (AL or AsAq) for 3 days, except in first trimester pregnant women of gestation, associated with primaquine 0.25 mg/kg/day for 14 days, according to the recommended doses;

When an ACT is selected as a first-line treatment for simple malaria, the NMCP should then identify another effective oral ACT as a second-line alternative treatment for cases of therapeutic failures greater than 10% during D28 follow-up. In order to limit the risk of resistance to TCAs, national health authorities should take appropriate measures to prohibit the marketing and use of oral artemisinin monotherapies in the public system [26].

Treatment of severe malaria: Management of severe malaria should be done in sanitary facilities with inpatient capacity. Any case of confirmed serious malaria should benefit from an antimalarial treatment with injectable Artesunate as soon as possible, in accordance with the national technical guidelines [26].

As part of the follow-up of the patient being treated, and as soon as their condition improves within 24 hr or more, replacement should be done with an effective oral ACT in accordance with current national guidelines for care.

Given the risk of death from severe malaria during the first 24 hr, especially when the waiting period between orientation and arrival at a reference structure is long, service providers at the health facilities without the means of management of severe cases of malaria should be administered to patients prior to the evacuation of pre-transferral treatment of artemisinin derivatives by intramuscular or rectal route in accordance with the national technical guidelines in force.

Surveillance of antimalarial efficacy: According to the WHO's "Test, Treat and Trace (T3)" [28] initiative, a rigorous and timely surveillance system for any case of confirmed malaria should be established for pharmacological monitoring of treatment and its efficacy. In this context, post-therapeutic parasitological monitoring should be systematic for any case of confirmed malaria in D3, D7 and D28. For *P. falciparum* malaria, the parasitaemia must be less than 25% in D3 and negative in D7 and D28.

In deciding whether or not to change an existing treatment policy, the NMCP should conduct a biennial evaluation of the therapeutic efficacy of the anti-malarials used in the country in accordance with the current WHO standard protocols. To this end, it should establish sentinel sites according to specific criteria, taking into account the types of epidemiological facies for continuous monitoring of the effectiveness of anti-malarials, under the leadership of the Ministry of Health and in collaboration with collaborative technical structures research, universities, WHO, and others collaborating centre's.

Pharmacovigilance: Cabo Verde through the Decree-Law no. 17/2017 [29] establishes the National Pharmacovigilance System and defines its rules for its organization and operation. This objective entity shall promote the safe and rational use of medicinal products by integrating pharmacovigilance activities into the various stages of the drug chain and in clinical practice, assessing and appropriately communicating the risks and effectiveness of the medicines used and promoting education, training and knowledge.

About malaria, the system should be implemented to ensure the safety of patients undergoing antimalarial treatment in the country. To do so, it must be of quality and implemented in health structures (public, private) at different levels of the health pyramid. In this context, the NMCP should collaborate with the authorized departments of the Ministry of Health and specialized institutions, namely ARFA (Agency for Regulation and Supervision of Pharmaceutical and Food) to ensure that antimalarial are taken into account in the development of technical guidelines on tools and surveillance as part of the implementation of a national pharmacovigilance plan.

Vector control: In the context of malaria elimination, the management of a malaria transmission focus should be based on the implementation of localized vector control interventions [30]. Integrated vector control should be targeted, especially in active infectious outbreaks or in specific situations, such as in response to a malaria epidemic [4,31-34]. In according with WHO recommendations, all malaria outbreaks should be carefully identified, mapped and monitored to detect potential transmission and act in real time to protect areas sensitive to transmission, including areas at risk of importing plasmodia [32,34].

National guidelines on integrated vector management [35] should be and updated regularly based on current WHO recommendations. The development of technical operational procedures on the application of IRS and Larval Control (LC) at the community level and the specifications of the insecticides to be used by the NMCP should be guided by current WHO recommendations (WHOPES). The IRS and/or LC should be implemented by the NMCP in specific areas as priority measures to protect the community for the elimination of malaria. Methods for destroying larval breeding sites may be chemical, biological or mechanical.

The indication of IRS and/or LC should be dictated by the epidemiological and entomological characteristics of each target area (non-transmitting area but receptive and presenting a risk of reintroduction of neighbouring endemic localities, response to a malaria epidemic). The initial implementation of the IRS and/or LC should be considered only after an analysis of the basic, epidemiological and entomological situation at the beginning of each intervention, which will allow for interim and final evaluations. The LC must be applied in an area only when the breeding sites to be treated are mapped, accessible and in limited numbers.

The impact of IRS and/or LC implementation in the intervention areas should be documented regularly through continuous monitoring, rapid assessments, and operational research projects on entomological and epidemiological profiles.

Management of the environment: In order to improve the living environment in general and the habitat in particular, environmental sanitation and environmental management measures should be popularized, especially in areas at risk of malaria [31,36]. The NMCP should develop a strong and diverse partnership with civil society, the private sector and other ministerial departments for the advocacy and highest-level engagement of national authorities in favour of a national management program "The environment". According to the multisectoral approach, the NMCP should be part of national efforts to mobilize specific resources for program implementation, particularly in urban areas.

Management of vector resistance to insecticides: According to WHO protocols and recommendations (WHOPES), the NMCP needs to implement a system to monitor the susceptibility of vectors to insecticides through sentinel sites [37-39]. The level and mechanisms of vector resistance to insecticides in the country should be mapped and regularly documented with the support of national research institutions and accredited universities.

Prevention and response to malaria epidemics: With climate change, areas of the country without the risk of malaria transmission could suffer reintroduction of the disease with the expansion of secondary cases [16-20]. Thus, given the scarcity of malaria cases in Cape Verde and increased trade with the continent, the NMCP needs to develop surveillance-based technical guidelines for the detection and prevention of sporadic epidemics, especially during the seasonal rainy season.

Prevention, detection and response to malaria epidemics should be carried out as part of an integrated national surveillance system for disease control. To that end, epidemiological and entomological surveillance should consider all localities in the country with transmission or risk of transmission, including, the proactive actions, through long-term measures aimed at reducing the risk of outbreaks in areas of high receptivity and vulnerability; systematic use of untreated nets and active screening among the population, as well as early stages (larvicide and long-term environmental management); Long-lasting impregnated mosquito nets (MILDA) and PIDs should be reserved for special situations, such as the arrival of a group of workers or students from a highly endemic country. Exceptionally, one of the interventions, MILDA or IRS, could be maintained in the medium term in a region that is highly receptive and vulnerable. Other strategy to be reinforced is the reactive responses, to foresee the possibility of a new reintroduction of malaria in areas without risk of transmission and, thus, the possibility of epidemics. For this, a strong surveillance system is needed, covering the entire country, especially in remote areas where outbreaks are possible. When a malaria epidemic is detected, the response must be rapid, complete and determined according to conventional control systems and methods in accordance with national NMCP guidelines [21].

The NMCP, with the support of its partners, should regularly strengthen the capacity of service providers and regional management teams in technical aspects of malaria prevention and response. It should Endeavour to provide specific resources to combat malaria epidemics as part of its strategic plans and annual action plans (surveillance, antimalarial stocks, insecticides, other essential inputs, documentation of possible epidemics).

Vaccination against malaria: The application of a candidate vaccine against malaria recommended by the WHO should be considered by the Cape Verde health authorities. To this end, the Ministry of Health, with the support of WHO and its partners, will have to take all necessary measures to meet the requirements to, among other things, define and adopt a national framework for the implementation of said vaccine in the country.

Support Interventions for Malaria Elimination

Advocacy, communication and social mobilization

The NMCP should intensify advocacy and communication activities to prevent the major challenge of shortening elimination efforts [40,41]. Indeed, with the paucity of malaria cases and hence the low impact reductions, the NMCP will have to maintain a continuing advocacy activity, nationally and internationally, to engage the Government and partners in understanding the situation and the importance of maintaining their support.

In addition, the NMCP should design and implement communication and capacity building programs, aimed at populations and health professionals, to prevent relaxation, and especially to ensure support for preventive and curative measures related to the elimination of malaria [42,43]. The strategy should include, information tools for travellers, nationals and residents of Cape Verde, visiting countries endemic to malaria to comply with the recommended malaria protection measures.

For the implementation of such a comprehensive program on media coverage of malaria elimination measures, a partnership framework with national communication structures, community based organizations, organized institutions (army, national police, municipal guard, customs, ...), migrant organizations, the private sector and professional health associations should be promoted, to better coordinate action and disseminate information on feasibility and best practices as well as public awareness of the national elimination strategy, the challenges it faces and the country's readiness for disposal.

Management of supply and stocks of antimalarial inputs

The continued availability of inputs to the fight against malaria is essential for the continuity of prevention and treatment services. The list of antimalarial and other malaria inputs established should be regularly updated in accordance with procedures established by the Ministry of Health and the WHO recommendation [27]. The NMCP, with the support of the parties involved in the fight against malaria, should define technical specifications and quantify the needs of antimalarial inputs according to the appropriate scientific method

(based on consumption or morbidity).

Purchasing and stock management should comply with the rules, procedures and directives issued by the MoH Department in collaboration with its partners, being the system of provisioning of health structures in antimalarial and other essential equipment an integral part of the policy defined by the Ministry of Health.

Quality control of antimalarial inputs

The regulation of medicines and other inputs for malaria should be part of the procedures established by the authorized departments of the MoH, particularly in the development of pharmaceutical policy, standards development, inspection and pharmacovigilance.

The recording and quality control of inputs for the control of malaria, both during acquisition and use (quality assurance), should be provided by the relevant MoH structures in partnership with the reference laboratories recommended by WHO.

Monitoring-evaluation and operational research

Strategic information on malaria is essential in making decisions for continuous improvement of program performance. The NMCP monitoring and evaluation system should be aligned with the MoH's monitoring and evaluation system. To this end, NMCP should develop a National Monitoring and Evaluation Plan aligned with the existing National Strategic Plan for Malaria Control and should focus on four main priorities: i) monitor the operational aspects of the program at all levels; ii) measure the observed changes in the implementation of control strategies, particularly in terms of program performance in the context of malaria elimination in the country; iii) conduct an appropriate analysis of the results of the implementation of the interventions, with a view to correcting the deficiencies observed in real time; and iv) documenting the success of the malaria elimination program;

Whenever the new Strategic Plan for malaria elimination (2019-2023), should also develop a Monitoring and Evaluation Plan for that period, in consultation with program partners and stakeholders. On the one hand, it should clearly describe the organization and functioning of the program's monitoring and evaluation system and, should have a performance structure with different types of indicators (process, effect, impact) allowing periodic evaluation of the performance of the program.

Routine surveillance should enable regular implementation of the program through rapid assessments of the performance of the NMCP by analyzing data collected at all levels of the health system, including in the private sector (clinics, hospital practices) and community (USB) and the implementation of methods to assess the impact of program interventions to be consistent with international recommendations, especially for national health research and household surveys.

A database at the level of NMCP and peripheral level coordination (Regions, Districts, and Communities), integrating information on the agreed indicators of the program, should be implemented and regularly updated to monitor progress and document the results of the program.

Operational research on malaria should remain a priority for the NMCP to periodically report on the effectiveness of the control interventions implemented. To this end, studies/surveys on the effectiveness and impact of control interventions should be carried out regularly in the country, in accordance with identified priorities, in particular on the entomological aspects and challenges in relation to pesticide and antimalarial resistance. These studies should be carried out within the framework of the procedures and ethical rules defined by the MoH, in particular when defining the main priorities for research on malaria.

Partnership mechanisms between the NMCP and national structures (research institutions, universities) involved in the fight against malaria should be strengthened to better coordinate priorities and objectives on issues of common concern.

Strengthening the Capacity of the Health System to Eliminate Malaria

To enable better program management and a functional coordination mechanism with partners, the NMCP should include among its priorities strengthening the institutional and operational capacities of the parties involved in the fight against malaria at different levels. The malaria elimination strategies must be pursued through a strengthened health system, with a clear definition of the roles of different stakeholders [44,45].

The integration of Malaria elimination into the National Health System should be done at all levels of the health pyramid, thought, the definition of norms, procedures and strategies for strengthening human resources in health, particularly in malaria (initial training, continuing training); planning and implementation of health activities at different levels; evaluation of the capacity and performance of health programs at different levels, and mobilization of Government resources and development partners.

Management of Malaria Elimination in Cape Verde

In order to strengthen and enhance the effectiveness of program delivery services, malaria control interventions must be mainstreamed at all levels of the health pyramid and receive adequate resources, especially national ones.

Institutional and Management Framework for Eliminating Malaria

Organization of the fight to eliminate malaria

The mission, organization and operation of the NMCP should be clearly defined according to the organizational framework of the MoH. To this, the NMCP organizational chart and the job descriptions of its different specialized units should be defined and adopted in the context of elimination of malaria. Taking into account the challenges related to the elimination of malaria, the MoH should establish a multisectoral Steering Committee (actors, civil society, other sectors) on the elimination of malaria with specific terms of reference. And its main mission is to coordinate actions and monitor the program's performance.

At the operational level, the organization and management of the malaria control must be ensured by teams at different levels (Municipalities, Regions, Communities) according to the institutional and operational procedures defined by the MoH at different levels, including in the community, need to be strengthened for more effective implementation and better ownership by actors and the population of interventions for malaria elimination. The implementation of malaria care activities and the monitoring of program performance should be done in close collaboration with central and peripheral actors and partners.

Due to the multiple challenges related to different aspects of malaria elimination, the NMCP should prioritize actions to: i) effective leadership in the fight against malaria; ii) a sufficient number of qualified staff at coordination level; iii) greater access to national resources as part of the strategic plan of the program; iv) motivational mechanisms in the context of strengthening the health system, and v) an adequate working and working framework for the structures responsible for the framing and management of malaria control at different levels of the health system.

Technical assistance in the elimination efforts and partners

As Cape Verde moves towards malaria elimination, the NMCP will increasingly require a variety of technical assistance with effective involvement in the implementation and monitoring/evaluation of field interventions, research, surveillance, case reporting, case detection mechanisms, country preparation for certification, and others [42,43]. In addition, technical assistance should enable specific studies on cost-effectiveness and documentation of successful experiences and the situation in the country with a view to elimination to be carried out.

The program should be based on a strong public-private partnership based on the "3" principle and in line with the partnership mechanisms defined by the Ministry of Health. To this end, the NMCP should strive to strengthen intersectoral collaboration and partnership especially with other sectors of the Ministry, NGOs and Associations, the Private Sector, Health Services of the Armed Forces, authorities and traditional organizations, Universities, Schools of Medicine and Public Health, Research Institutions, Religious Organizations and Communities.

Cross-border initiatives to reduce the risk of reintroduction

Cross-border collaboration should be at the beginning of the elimination process for better management of re-importation of malaria cases in Cape Verde [46]. Once the transmission of malaria has been halted, the NMCP must be prepared to face one of the greatest challenges of maintaining elimination, preventing potential re-introduction of cases through migrant populations or visitors to the continent [46-48]. To this, the NMCP needs to implement an active surveillance system to minimize re-importation of cases with a two-pronged approach, focusing both on the domestic side (imported cases) and on the outside (massive case screening, individuals reaching airport or ports, by sea from the mainland: all those who have positive results, whether domestic or foreign, must be treated free of charge and accompanied by at least two weeks).

Financing of malaria elimination

Funding for the fight against malaria in Cape Verde should be part of a national momentum for financing the Health Development Plan of the MoH. As the elimination of malaria is an expensive process, the NMCP needs to implement an effective resource mobilization strategy with the Government and international partners. In this context, the NMCP should develop Cyclic Strategic Plans and Operational Action Plans on Malaria Elimination to mobilize the necessary resources. It should therefore take advantage of all funding opportunities through national and international initiatives to address the programmatic and financial needs of the current strategic plan.

In line with the promises of the Abuja Summit in 2000 and 2006 on Malaria [49,50], Cape Verde should continue to implement the recommendations adopted, including the universal access of populations to preventive and curative services for malaria, in accordance with existing national social protection systems and abolition of taxes and customs duties on antimalarial inputs.

Framework of the Implementation of the Elimination Strategy

The National Strategy for the Elimination of Malaria in Cape Verde should be implemented in accordance with the National Health Policy. The National Strategy should be based in particular on:

- Continued political engagement in the elimination of malaria;
- A program planning system aligned with the national plan for health development and inspired by the global objectives and strategies to which Cape Verde has adhered;
- Integration of control interventions in the health system and in the various economic development projects;
- Harmonization of the rules and procedures for interventions in the prevention and treatment of malaria;
- Universal access of populations at risk of malaria, especially the most vulnerable, to packages of services provided for the elimination of malaria;
- The continuous strengthening of the capacities of stakeholders at different levels in the implementation of the malaria elimination strategy (actors, partners);
- The implementation of community-based interventions for effective involvement and ownership of beneficiary communities;
- The implementation of integrated communication strategies adapted to the malaria elimination context for effective change in the behavior of populations at risk for the prevention and early treatment of the disease;
- Effective coordination between the various stakeholders, particularly intra and intersectoral;
- Permanent advocacy with the Government, technical and financial partners, the private sector, local authorities and communities to mobilize financial resources, especially national resources, to accelerate the elimination of malaria;
- Continuous documentation of the results of the program to provide valid strategic information for decision-making in the perspective of the malaria elimination certification process.

Conclusion

Malaria data and policies in Cape Verde shows that the country has stopped transmission in the past, however, it has not been possible to consolidate this achievement. Nevertheless, it appears that the archipelago is one of the best candidates to achieve elimination in the sub region by 2020. The country has made efforts in recent years in several areas. However, the epidemiological profile of the disease also requires that the strategies be adjusted to the context of elimination, updated operational capacities and adequate funding ensured, in addition to what is already committed by the national authorities, Global Fund, WHO and other partners. Opportunities for intersectoral and international collaboration need to be maximized and, above all, the adoption of a community involvement approach and substantial efforts must be continued.

The National malaria elimination strategy, as a dynamic tool, needs to be updated where necessary, in line with new national guidelines and/or in a global context, with new and effective malaria elimination strategies. Any possible revision of the strategy, policies and interventions, should be done in collaboration with stakeholders involved at all levels and development partners.

Acknowledgment

We would like to thank all the members of the team who worked in the concept of the national document for malaria elimination in Cabo Verde.

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