

Editorial

Ethiopia: Moving towards evidence-based malaria elimination program

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As affirmed in the 2010 review (MOH 2010) and repeatedly underscored in articles in this special issue (Nigatu et al. 2019.1, 2019.2; Yohannes 2019; Mekuriaw et al. 2019; Waldetensai et al. 2019) and all major government (MOH 2010; MOH 2011; MOH 2014) and other review (Deressa et al. 2006; Alemu et al. 2012; WHO 2017; Deribew et al. 2017; Vajda and Webb 2017; EPHI 2016) documents, malaria remains a major challenge in Ethiopia. In spite of important gains in anti-malarial interventions “Almost three-fourths of the total landmass and above half of the total population are at malaria risk” (Nigatu et al. 2019.1). Major challenges remain and in the perpetual dance a duo [or is it a trio/parasite-vector-host?] (McCann 2014) we should anticipate surprise moves such as new vectors (Kinfé et al. 2019); more outdoor transmission (Nigatu 2019.2; Gatton et al. 2013 citing cases from Ethiopia); peak biting activity shifting to the early part of the night or “... shifting behavior of malaria vectors following prolonged deployment of indoor based vector control interventions (IRS and LLINs)” (Nigatu 2019.2); potential for reintroduction in areas where it has been eliminated (Yukich et al. 2013); climate change induced malaria shifting to higher altitude areas (Vajda and Webb 2017; Alonso et al. 2011; Siraj et al. 2014; Bouma et al. 2016); development related e.g. dams increases (Deribew et al. 2017; Vajda and Webb 2017; Lautze et al. 2007; Kibret et al. 2016); or malaria considered a predominantly rural disease becoming a considerable urban health problem (Donnelly et al. 2005). On the opportunities side, note the possible return of chloroquine-sensitive *Plasmodium falciparum* parasites (Mekonnen et al. 2014) and Ethiopians holding lead positions as CEO of the Roll Back Malaria (RBM) Partnership or director-general of the World Health Organization (PATH MACEPA 2017).

In this context of high burden of disease and major social and economic impact (Nkumama et al. 2017) and even famine (Mengesha et al. 1998), the lure of resolving the problem once for all – elimination/eradication – is compelling. Thus, Ethiopia decided, in 1958, probably prompted by the well documented and severe epidemic in that year (Fontane and Najjar 1961), to join the malaria eradication effort

of the 1950s. A lot has been written about the motivations, outcomes and challenges and failures of that effort (Kitaw 1969, 1981; Farid 1980; Gish 1992; Kitaw et al. 1998). Now, some 60 years later, Ethiopia has once again joined the elimination (an euphemism for eradication?) band wagon – “at the cutting edge” (McCann 2014) - and was one of the first countries to embrace the Scaling Up for Impact (SUFi) concept for malaria control and develop successive strategic plans to achieve malaria elimination within specific geographical areas with historically low malaria transmission by 2015 (MOH 2010 2014). The government has developed a national strategic plan (2014 – 2020) for the prevention, control and elimination of the disease (MOH 2014; Kinfé 2019). In spite of major gains - 39% of households with at least one LLIN for two people (Nigatu et al. 2019.2), 95% reduction in deaths over 25 years (Deribew et al. 2017) -, major challenges persist (MOH 2011; Deribew et al. 2017) and achieving ‘elimination’ will require sustained and evidence-based policies, strategies and implementation plans.

This is where research institutions such as EPHI could, as shown in the articles in this special issue, play a pivotal role. The government (MOH 2010; Nigatu et al. 2019.2) has called upon research institutions and universities to support its effort with operational research. As demonstrated by articles in this issue and others, the needs are extensive. Entomological information is still limited (Kinfé 2019). There are local evidences of widespread resistance to insecticides used for IRS (Nigatu et al. 2019.1; Mekuriaw et al. 2019) and LLINs (Nigatu et al. 2019.2; Waldetensai et al. 2019); the need therefore to develop and implement a national plan for insecticide resistance monitoring and management. For IRS, there is need to assess quality on different wall surfaces, determine the residual efficacy, estimate the decay rate, evaluate community acceptability etc. (Nigatu et al. 2019.1). Of note, community resistance was one of the major challenges of the previous malaria eradication program (Kitaw 1969) and present efforts (Deribew et al. 2017) in the highly ecologically, socially and economically diverse (Kitaw et al. 2017) Ethiopian context. Potential mosquito breeding sites

should be identified and appropriate Mosquito Larval Source Management (LSM) undertaken (Yohannes 2019; Kinfe 2019). Studies on effective duration, retention and efficacy of LLINs are scarce (Mekuriaw et al. 2019; Waldetensai et al. 2019). There are also signs of increasing parasite resistance (Mekonnen et al. 2014; Beyene et al. 2016). The potential impacts of development activities and accelerating urbanization; the assessment and adoption new technologies; e.g. remote sensing (Midekisa et al. 2012), malaria antibody (i.e. serological) test (Birhanu et al. 2018) require studies as “Conventional tools of malaria surveillance and response are likely not sufficient in many elimination settings (Jacobson et al. 2017) even though the Integrated Disease Surveillance and Response [IDSR] for malaria in Ethiopia is considered reasonably functional (Jima et al. 2012). Overall, combined environmental monitoring and epidemiological surveillance and spatially stratified approaches that reflect the altitudinal and climatic diversity of the country (Midekisa et al. 2015) are required. There is also an urgent need to harmonize information collection and reporting (MOH 2011).

The future in malaria program holds promises and challenges. “Malaria is a multifactorial disease, because the etiological agent has a complex life cycle requiring an insect vector, and the factors that regulate its distribution and abundance are diverse and complex” (Siraj et al 2014; see also McCann 2014). As indicated in the FMOH 2010 review, “During the last decade, there have been substantial changes in the interventions and the delivery strategies for essentially all of malaria control... We can expect that a similar or even faster degree of change will occur in the coming years. In the coming decade, we can anticipate the arrival of a malaria vaccine, new diagnostics, new drugs and insecticides, and new strategies, including enhanced surveillance, to interrupt transmission” (MOH 2011). On the other hand, there are indications of emerging behavioral and species changes but the data base is weak (Gatton et al. 2013).

Lessons from previous experiences, the eradication attempt in particular (Kitaw 1969; Kitaw et al. 1998), show that the challenges of the elimination effort should not be underestimated. Currently, the global fight against malaria has stalled (WHO 2018). The bottom line for success is anchoring programs on as evidence-based – “thoroughly evaluating societal and political issues” (Aylward et al. 2000) in particular –, adapted and sustainable program as possible.

For academic and research Institutions, the challenge is “To identify problems and to design and implement research activities that fit the local conditions (representativeness & standard of protocol) so that the

findings will have the quality to be used to influence policy” (MOH 2010). This implies major efforts in defining/reviewing priorities, building capacity and fostering collaboration. The articles in this special issue seem to indicate that EPHI is on track as they indicate focus on priority issues, building capacity and collaboration as most articles are multiple authors involving multiple institutions (NMCP, FMOH; Arab Minch U; Jimma U; Mekelle U; AAU; PATH/MACEPA; UNICEF; CSA; USAID/PMI; ACIPH). It seems appropriate to conclude with the wise words of the Second General Report of the Malaria Commission of the League of Nations issued in 1927: “... the fight against malaria must be waged not as a separate and isolated task but as part of a general social, economic and sanitary campaign by an enlightened public health service which is able to obtain assistance from other Government departments and from unofficial agencies, and to secure continuity of action and unity of purpose” (as quoted in Aylward et al. 2000) and those of African malaria experts “...malaria can be beaten, but it will require significant political will as well as continued research on scientific breakthroughs and an emphasis on using both old and new tools” (Wernsdorfer et al. 2009; Kamwi et al. 2018). As McCann (2014) points out, “We have some tools, some hope, but no panacea”.

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