



Underlying Challenges in the Path of Malaria Elimination: From India Perspective

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Authors' contributions

This work was carried out in collaboration among all authors. Authors PKC and MKC designed the present study. Authors AV, NS, PP and MKC conducted literature review. Authors PKC, MKC and PP wrote this paper. All authors read and approved the final manuscript.

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ABSTRACT

India has shown its determination to achieve malaria elimination by 2030. However, several challenges, which might be potential roadblocks for malaria elimination goal. Among many, few are unreliability on existing reporting system; suitable surveillance methods; presence of asymptomatic parasitic carriers in the endemic population; and increasing insecticide resistance status among the malaria vectors. Nonetheless, stride towards malaria elimination is only achievable, if requisite emphasis would be given on the surveillance system, asymptomatic parasitic reservoirs and address of insecticide resistance status. Additionally, strengthening of the health infrastructure, adequate manpower at primary level and sustainable funding would also be required. The main objective of this paper is to highlight the existing major challenges in the path of Malaria Elimination in India by 2030.

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ABBREVIATIONS

ACD: Active Case Detection, APCD: Activated Passive Case Detection, APMEN: Asia Pacific Malaria Elimination Network, IRS: Indoor Residual Spray, LLIN: Long Lasting Insecticide-Treated Nets, MDG: Millennium Development Goals, PCD: Passive Case Detection, PACD: Proactive Case Detection, RACD: Reactive Case Detection.

1. INTRODUCTION

Malaria elimination is the ultimate goal of global malaria control campaigns. Earlier, Millennium Development Goals (MDG) had aimed to reduce the global malaria burden by 75% in 2015, but it could not be achieved completely. With the scale-up of funding and malaria control interventions, nearly 100 countries have been malaria-free and by 2016, WHO has also identified 21 countries to eliminate malaria by the year 2020 [1]. World Health Assembly has announced the “Global Technical Strategy for Malaria 2016–2030”, with the target of 90% reduction in global malaria morbidity and mortality by the end of 2030.

India launched the National Framework for Malaria Elimination in 2016 and is one among the several contenders marching for malaria elimination [2]. Though there are several impending challenges, an attempt has been made to highlight the currently existing major challenges in the country and attract appropriate attention.

Key underlying challenges are discussed below:

2. UNRELIABLE REPORTING MECHANISM OF A HEALTH CARE SYSTEM

First and foremost, the step of any public health program is to accurately quantify the problem or estimate the frequency of disease occurrence. Although India reports a decline in malaria morbidity and mortality in past few decades, contrarily many individual studies have suggested, the actual proportion of morbidity and mortality is much higher (68% to 98%) than a total number of reported malaria cases [3-7]. Nevertheless, there are contrasting views related to the total mortality by a different group of experts [8,9].

It is to be considered, if such underreporting exists, then estimated logistic management might not be sufficient to measure the magnitude of the malaria incidence. The underreporting could be due to several plausible reasons, such as

reluctance of primary health care providers and/or inefficiency in the basic health care system or performance stress at the grass-root level, along with the non-functioning or unavailability of appropriate facilities.

Strengthening the primary health care system could be a possible answer, whilst robust mechanism to strengthen database management and effective monitoring would require trained manpower and adequate infrastructure.

3. TYPE OF ACTIVE CASE DETECTION/ SURVEILLANCE ACTIVITY

A strong and effective surveillance system is vital to the implementation of malaria elimination program. There are several case detection techniques usually employed in the surveillance system of malaria control activities, such as passive case detection (PCD), activated passive case detection (APCD), proactive case detection (PACD), reactive case detection (RACD) and active case detection (ACD) method. In 2012, WHO guideline recommended the deployment of ACD preferably over PCD for routine malaria surveillance. ACD underwrites a substantial role in the interruption of malaria transmission [10]. It is absolute to define and conceptualize the active case detection method, more suitable to the region [11].

Sri Lanka, a neighbour country’s advancement towards malaria elimination can largely be attributed to increasing surveillance activity and thoughtful engagement of control methods [12]. A countrywide survey among Asia Pacific Malaria Elimination Network (APMEN) has described, different ACD techniques were adopted in concord with the country’s situation, suitability and geographic environment and so varied widely [13].

Currently, in India, both routine ACD and PCD are in place. However, RACD, an active surveillance technique, started by passive cases and followed by the screening of families or residents within a specified region, typically in a pre-determined radius, might be useful. Also,

classification of high-risk groups other than under-five children and pregnant women, such as armed forces in the endemic areas and migratory population in border areas should be considered. Stratified screening of the aforementioned high-risk groups would further ease the process of surveillance through a focused approach.

4. EXISTENCE OF ASYMPTOMATIC PARASITIC CARRIERS IN THE ENDEMIC POPULATION

Asymptomatic Plasmodium parasitemia plays a crucial role in the ecology of indigenous malaria transmission as it acts as a reservoir of infection [14,15] and without targeting this subset of the population, planning of malaria elimination would essentially be insufficient [16]. The existence of sub-clinical malarial infection and its transmission in Indian sub-continent still reported from the malaria-endemic parts of India [17]. The presence of asymptomatic carriers in the population can jeopardize the parasite elimination efforts of the country's malaria elimination program. Till date, no due attention has been given to tackle this hidden challenge. Percentage of these subclinical carriers could be more in the endemic states with varying proportion.

WHO 2012 guidelines suggested several strategies which could be useful to deal with asymptomatic carriers. Identification of hotspots, hot population, geographic clusters and robust geographic-based active surveillance to disrupt ongoing transmission are few among them.

5. THE UPSURGE OF INSECTICIDE RESISTANCE OF ROUTINELY USED INSECTICIDES AMONG MALARIA VECTORS

Knowledge about vector resistance and time trends in endemic areas are prerequisite to monitor insecticide use for the country's malaria elimination programs. Among six known malaria vector species, *Anopheles culicifacies* contributes more than half of the malaria morbidity. Entomological studies across India suggests that *Anopheles culicifacies* was resistant to at least one insecticide in 2/3rd of the surveyed districts [18,19]. This increasing insecticide resistance, especially in synthetic pyrethroids among malaria vectors, is of serious concern in many endemic countries including India, where deltamethrin impregnated Long-

Lasting Insecticide-treated Nets (LLINs) intervention and alpha-cypermethrin Indoor residual spray (IRS) were used as a main malaria control strategy for many decades.

Across India, synthetic pyrethroid resistance emerged more rapidly than previously assumed. Several states including tribal populated states such as Chhattisgarh, and Andhra Pradesh, have shown a shift of trend towards resistance in malaria vectors [20,21].

These changing resistance patterns seek definite consideration mainly due to the availability of limited molecules to combat malaria vectors. Systematic monitoring of malaria vector resistance in the endemic regions, combined with routine documentation and reporting of resistance level in the malaria vectors is thus required to subdue the problem.

6. CONCLUSION

India is a geographically, linguistically, and politically heterogeneous subcontinent leading to multifold and multifaceted public health and disease control challenges. Recognizing the challenges will help in dedicating required attention on the issues, thereby assisting in the alleviation of the problem and reaching the goal of malaria elimination. The delineated components in the present article will help to expedite the goal of malaria elimination in India. It is imperative to highlight these issues, and the authors hope to bring the attention of the policymakers so that further malaria elimination can be achieved in stipulated time.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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