Journal of Socialomics
ISSN: 2167-0358

Karunamoorthi, J Socialomics 2012, 1:2
DOI: 10.4172/2167-0358.1000e108

Editorial Open Access

Global Malaria Burden: Socialomics Implications

Kaliyaperumal Karunamoorthi[1,2]*

[1]Department of Environmental Health Sciences & Technology, College of Public Health and Medical Sciences, Jimma University, Jimma, Ethiopia
[2]Research and Development Centre, Bharathiar University, Coimbatore, Tamil Nadu, India

Malaria: A Global Burden

Arthropod-borne diseases are major causes of morbidity and mortality in many tropical and subtropical countries and principally the devastating nature of malaria is indubitably intolerable [1]. Malaria has been one of the most potent scourges of mankind from time immemorial and it is one of the three major communicable diseases [2]. The recent WHO Malaria Report 2011 [3] estimates that 3.3 billion people were at the risk of malaria in 2010, although of all geographical regions, populations living in sub-Saharan Africa (SSA) have the highest risk of acquiring malaria; among 216 million episodes of malaria in 2010, which approximately 81%, or 174 million cases, were reported from the African Region. There were an estimated 655,000 of malaria deaths in 2010, of which 91% were from Africa.

Malaria in Pregnancy

Malaria in pregnancy imposes a serious threat to the mother, fetus and neonate, as pregnancy reduces a woman's immunity, increasing the risk of malaria infection. Despite the availability of effective interventions, malaria remains as one of the most important cause of maternal and childhood morbidity and mortality in SSA [4]. It is also an important cause of stillbirths, low birth weight, and early infant mortality [5]. Malaria kills a poor African child for every 45 seconds and continues to be a major public health problem in the resource-limited countries of Africa, Asia, and Latin America and beyond [6]. Malaria also hampers children's schooling and hence the social development through both absenteeism and permanent neurological disorder and other damages associated with the severe episodes of the disease [7].

Social and Economic Burden

Malaria affects the health and wealth of individuals as well as nations. In Africa today, malaria is identified both as a disease of poverty and a cause of poverty. The social burden of malaria in fact remains elusive. It is not a universal entity that can be measured or quantified, however it can be understood and linked to the outcomes such as morbidity and mortality [8]. Malaria causes repeated work absenteeism resulting in short and long term losses in productivity as the main transmission periods coincide with the peak agricultural and harvesting seasons [9], causing poverty and hindering the development of the malaria endemic countries [7].

Malaria has significant, measurable, direct and indirect costs, and has been shown to be a major constraint to economic development. The direct costs of malaria include a combination of personal and public expenditures on both prevention and treatment of the disease [10]. At the micro level the personal expenditures include individual or family spending on insecticide-treated nets (ITNs), doctors' fees, antimalarials, transport to health facilities, and support for the patient and an accompanying family member during hospital stays [7]. At the macro level the economic burden of malaria is estimated at an average annual reduction in economic growth of 1.3% for those African countries with the highest burden with an estimated 12 billion USD loss to the African continent's Gross Domestic Product (GDP) annually [11]. Over the years, this penalty leads to substantial differences in GDP between countries with and without malaria and severely restrains the economic growth of the entire region [7].

Malaria and Africa: A Call for Better Understanding

The greatest burden of malaria, by far, remains in the heartland of Africa, characterized by large contiguous areas of high transmission, low coverage of control interventions, and limited infrastructure to monitor disease trends. In many cases, political and economic factors have greatly hindered, even rudimentary control interventions or disease monitoring [12]. The burden of malaria has decreased dramatically within the past several years in parts of sub-Saharan Africa due to the scale-up of interventions and it is important to note that the reductions in malaria have not been uniform between and within countries, with some areas experiencing resurgence instead [13]. Furthermore, while interventions have greatly reduced the burden of malaria in many countries, it is also recognized that the malaria decline pre-dated widespread intervention efforts. This raises more questions as what are the other factors that might have been contributing to the significant reduction in malaria transmission and to what extent as well [13].

Conventional Major Interventions: Inevitable

Historically, vector control has had significant impact on malaria control and even today, it remains considered as a corner stone due to the lack of reliable vaccine, emergence of drug resistance and unaffordable potent antimalarial. At the moment, malaria control is one of the most serious challenging tasks due to the spread of multi-drug resistant strains of *Plasmodium falciparum*, insecticide resistance, poverty, fragile healthcare infrastructure and ecosystem degradation [14]. Currently, although we are not equipped with magic bullets, effective low-cost intervention strategies are available for effective malaria prevention and control [9].

There is convincing scientific evidence that ITNs are effective in reducing malaria-burden [15]. ITNs usage not only protects the individual user but also the others living in the community and serves as a trap to kill mosquitoes [16-18]. Indoor Residual Spraying (IRS) is

***Corresponding author:** Kaliyaperumal Karunamoorthi, Department of Environmental Health Sciences & Technology, College of Public Health and Medical Sciences, Jimma University, Jimma, Ethiopia, Tel: +91-9600-918-524 & +251-913-547-847; Fax No: +251-471-111-450; E-mail: k_karunamoorthi@yahoo.com

Received February 16, 2012; **Accepted** February 17, 2012; **Published** February 28, 2012

Citation: Karunamoorthi K (2012) Global Malaria Burden: Socialomics Implications. J Socialomics 1:e108. doi:10.4172/2167-0358.1000e108

an effective method, is aimed at killing mosquitoes that enter houses when they rest on sprayed surfaces. However, the major set-backs are emergence of insecticide resistance and the community acceptance due to harmfulness of insecticides to the environment and human health [19]. Artemisinin-based combination therapies (ACTs) are highly effective to reduce gametocyte carriage there by lowering the risk of infectiousness [20]. However, a recent study reported a sign of resistance along the Thai–Cambodian border [21].

At the moment, malaria control heavily relies on limited number of arsenals viz., artemisinin derivatives and pyrethroids. However, these also could be ineffective due to physiological resistance development at any moment. In this perspective, innovative user and environmental-friendly alternative approach is apparently inevitable. Therefore, exploration and development of novel and powerful contextual community based vector control interventions is also warranted [14].

Existing Innovative Strategies: A Source of Optimism

Microbial applications in malaria transmission control have drawn global attention. Mosquito midgut microbiota can modulate vector immunity and block *Plasmodium* development. Paratransgenic manipulation of bacterial symbionts and *Wolbachia* can affect reproductive characteristics of mosquitoes. Transgenic fungi can express antiplasmodial effector molecules that can target the parasite inside its vector. Viral pathogen show efficacy in the interruption of sporogonic development of the parasite, and protozoal pathogens exert direct pathogenic potential on larvae and adults with substantial effects on mosquito longevity and fecundity. Although, many agents show promising results, the question remains about the epidemiologic reality of these approaches which still have certain limitations [22].

Systemic endectocidal drugs, used to control nematodes in humans and other vertebrates, can be toxic to *Anopheles* spp. mosquitoes when they take a blood meal from a host. Recent laboratory and field studies have highlighted the potential of ivermectin to control malaria parasite transmission. However, a better understanding of drug effects against vectors and malaria ecologies are needed. In the near future, ivermectin and other endectocides could serve as potent and novel malaria transmission control tools that are directly linked to the control of neglected tropical diseases in the same communities [23].

Daunting Challenges and Opportunities

In the recent past, a few countries have attained malaria elimination by employing the exiting front-line vector control interventions and active case management. However, still many challenges lie ahead on the long road to the meaningful accomplishment of malaria control [14]. Though, ITNs protect the people against mosquitoes and malaria, there is a possibility to get infected due to early evening biting of *Anopheles* mosquitoes. It demands other complementary measures like the usage of different types of repellents and they could serve as a supplementary tool in combination with ongoing anti-vector interventions [24].

Insecticide resistance is spreading in east Africa and other areas to the commonly used insecticides, including permethrin and dichlorodiphenyltrichloroethane (DDT) [25] but there are no new classes of insecticides in late stage development. Therefore, we must focus on research that accelerates development of new tools to support effective use of existing ones [26]. The irrational use and continued over-reliance on artemisinin monotherapies are undermining the gold standard for malaria treatment, ACTs [26]. Resistance to ACTs could render ineffectiveness to many of the other endoperoxide drug candidates too, which are being developed as synthetic alternatives to artemisinin [27].

In the human history since time immemorial, plants have been used as insect repellent in order to avoid insects' annoyance. Even today, in many parts of the world, people are using various plants as repellents to prevent disease transmission [28]. However, since their efficiency is uncertain, conducting intensive research on the identification and development of novel potent and low-cost plant-based repellents is quite essential and inevitable [24]. The explosive global economic development, people movement, water projects, climate change and increased urbanization have substantially altered the disease transmission dynamics and pattern too and this in turn requires implementing need-based and community-oriented malaria control strategies.

Conclusion

Malaria is a disease of poverty inflicting a serious negative impact on health and socioeconomic development in the poorest countries of the world that cannot afford to succeed. Presently we have minimized the global malaria burden considerably, by inducting the low-cost interventions like ITNs due to the stringent effort and commitment of the public health professionals, international donors, public and private partnership. However, the decline of the malaria burden within and between the countries is not uniform. The specific reason and the role of correlated compounding factors stay unidentified and imprecise that needs to be recognized by the global public health experts instantly.

Malaria is both a preventable and curable illness. We are living in the age of social media networking and it has reached the unprecedented growth and success worldwide. Consequently we must use this unique opportunity to reduce the malaria burden by devising an appropriate communication strategy to transfigure the desirable behavior change in the society. It can be succeeded by means of social documentary (radio, television and social media), printed media and public health awareness campaigns.

In addition, cell phones being the major mode of communication even in the remote rural areas of low- and middle-income countries, advising the people to sleep under their ITNs via text message (SMS) or reminders could be one of the viable solutions to address the existing malaria crisis. This must be introduced and promoted in all the malaria-prone countries. Besides, increasing the funds to the poverty alleviation schemes is extremely important and inevitable to minimize the global malaria burden in the near future.

Acknowledgements

I would like to thank Mrs Melita Prakash for her sincere assistance in editing the manuscript. My last but not least heartfelt thanks go to my colleagues from the Department of Environmental Health Science, College of Public Health & Medical Sciences, Jimma University, Ethiopia, for their kind support and cooperation.

References

1. Karunamoorthi K, Ilango K (2010) Larvicidal activity of Cymbopogon citratus (DC) Stapf. and Croton macrostachyus Del. against Anopheles arabiensis Patton, the principal malaria vector. Eur Rev Med Pharmacol Sci 14: 57-62.
2. Lewison G, Srivastava D (2008) Malaria research, 1980–2004, and the burden of disease. Acta Trop 106: 96-103.

3. WHO Malaria Report 2011. World health Organization, Geneva, Switzerland.
4. Karunamoorthi K, Deboch B, Tafere Y (2010) Knowledge and practice concerning malaria, insecticide-treated net (ITN) utilization and antimalarial treatment among pregnant women attending specialist antenatal clinics. J Pub Health 18: 559-566.
5. Menendez C (1995) Malaria during pregnancy: a priority area of malaria research and control. Parasitol Today 11: 178-183.
6. Karunamoorthi K (2012) Global Malaria Eradication: Is It Still Achievable and Practicable? Malaria: Etiology, Pathogenesis and Treatments. Anna Margrét Peterson and Gerald E. Calamandrei ISBN: 978-1-62100-363-2. Nova Science Publishers, New York, USA.
7. Roll Back Malaria (RBM) (1998) Economic costs of malaria.
8. Jones COH, Williams HA (2004) The social burden of malaria: what are we measuring? Am J Trop Med Hyg 71: 156-161.
9. Karunamoorthi K, Bekele M (2009) Prevalence of malaria from peripheral blood smears examination: A 1-year retrospective study from the Serbo Health Center, Kersa Woreda, Ethiopia. J Infect Pub Health 2: 171-176.
10. van Ballegoyen AF (2005) Roll back malaria: A WHO initiated network in the fight against malaria.
11. WHO Malaria Report 2009. World health Organization, Geneva, Switzerland.
12. Yeka A, Gasasira A, Mpimbaza A, Achan J, Nankabirwa J, et al. (2011) Malaria in Uganda: Challenges to control on the long road to elimination I. Epidemiology and current control efforts. Acta Trop.
13. Mharakurwa S, Thuma PE, Norris DE, Mulenga M, Chalwe V, et al. (2011) Malaria epidemiology and control in Southern Africa. Acta Trop.
14. Karunamoorthi K (2011) Vector Control: A Cornerstone in the Malaria Elimination Campaign. Clin Microbiol Infect 17: 1608-1616.
15. Lengeler C, Grabowsky M, McGuire D, deSavigny D (2007) Quick wins versus sustainability: options for the upscaling of insecticide-treated nets. Am J Trop Med Hyg 77: 222-226.
16. Maxwell CA, Msuya E, Sudi M, Njunwa KJ, Carneiro IA, et al. (2002) Effect of community-wide use of insecticide-treated nets for 3-4 years on malarial morbidity in Tanzania. Trop Med Intern Health 7: 1003-1008.
17. Curtis CF, Jana-Kara B, Maxwell CA (2003) Insecticide treated nets: impact on vector populations and relevance of initial intensity of transmission and pyrethroid resistance. J Vector Borne Dis 40:1-8.
18. Hawley WA, Phillips-Howard PA, Ter Kuile FO, Terlouw DJ, Vulule JM, et al. (2003) Community-wide effects of permethrin-treated bed nets on child mortality and malaria morbidity in western Kenya. Am J Trop Med Hyg 68: 121-127.
19. WHO (2006) Global Malaria Programme. Indoor residual spraying Use of indoor residual spraying for scaling up global malaria control and elimination. Geneva, Switzerland.
20. Malenga G, Palmer A, Staedke S, Kazadi W, Mutabingwa T, et al. (2005) Antimalarial treatment with artemisinin combination therapy in Africa. BMJ 331: 706-707.
21. Dondorp AM, Nosten F, Poravuth Y, Das D, Phyo AP, et al. (2009) Artemisinin resistance in Plasmodium falciparum malaria. N Engl J Med 361: 455-467.
22. Abdul-Ghani R, Al-Mekhlafi AM, Alabsi MS (2012) Microbial control of malaria: Biological warfare against the parasite and its vector. Acta Trop 121: 71-84.
23. Foy BD, Kobylinski KC, da Silva IM, Rasgon JL, Sylla M (2011) Endectocides for malaria control. Trend Parasitol 27: 423-428.
24. Karunamoorthi K (2012) Plant-Based Insect Repellents: Is That a Sustainable Option to Curb the Malaria Burden in Africa? Med Aromat Plant 1:e106.
25. Corbel V, N'Guessan R, Brengues C, Chandre F, Djogbenou L, et al. (2007) Multiple insecticide resistance mechanisms in Anopheles gambiae and Culex quinquefasciatus from Benin, West Africa. Acta Trop 101: 207-216.
26. Kilama W, Ntoumi F (2009) Malaria: a research agenda for the eradication era. The Lancet 374: 1480-1482.
27. Wells T (2008) A question of quality: interview with Chris Hentschel, President & CEO of MMV.
28. Karunamoorthi K, Ramanujam S, Rathinasamy R (2008) Evaluation of leaf extracts of Vitex negundo L. (Family: Verbenaceae) against larvae of Culex tritaeniorhynchus and repellent activity on adult vector mosquitoes. Parasitol Res 103: 545-550.