

A Review of Vector Borne Diseases: A Major Health Concern to Human Life

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Abstract

Vector born disease constitute an important cause of morbidity and mortality worldwide. Billions of people are at risk from vector borne diseases that are transmitted by mosquitoes, fleas and other vectors. The most widely known vector borne diseases in India are Malaria, Dengue, Chikungunya, Japanese encephalitis, Lymphatic filariasis and Kala-Azar. The vector of these diseases are a major concern to dipterologist in India. The cases of vector borne diseases are increasing day by day due to climate change and globalization. These diseases are endemic in more than 100 countries and affect more than half of the world population. These diseases intensified their severity day by day because it's very difficult to predict, control and prevent from vector borne diseases. So it's the need of time to increase its awareness & use the existing knowledge and practice to control these diseases in community, so that we can develop a suitable and effective health strategies.

Key words: *Malaria, Dengue, Lymphatic filariasis, chikungunya, Integrated Vector Management*

Introduction

Female Vectors are the organism that play a role in transmission of a pathogen between humans or from animals to humans. In practice vectors are known to be blood sucking insects that ingest the disease causing organism with the blood from an

infected host and then inject it into a new host at the time of subsequent blood meal. Mosquitoes and sand flies are best known for their role in transmitting diseases but some flies can also do the same.

Some of the important vectors and disease transmitted by them are as follows

Insect Vector

Transmitted disease

Insect Vector	Transmitted disease
1. Aedes Mosquito	Chikungunya, Dengue fever, Lymphatic Filariasis, Yellow fever and Zika virus
2. Anopheles Mosquito	Malaria, Lymphatic filariasis
3. Culex Mosquito	Japanese encephalitis, Lymphatic filariasis and West Nile fever
4. Sand flies	Leishmaniasis, Sand fly fever, Oriental sore and Bartonellosis
5. Ticks	Crimean-congo hemorrhagic fever, Lyme disease, Relapsing fever, Rickettsial disease and Tick born encephalitis
6. Triatomine bugs	Chagas disease (American trypanosomiasis)
7. Tsetse flies	Sleeping sickness (African trypanosomiasis)
8. Fleas	Plague
9. Lice	Typhus and louse born relapsing fever
10. Black flies	Onchocerciasis

VBDs (Vector Borne Diseases) continue to represent a global threat, with old diseases like malaria and emergent new diseases like Zika and West Nile fever. Because of an increase in international trade, demographic growth and rapid urbanization, the Zika virus is one of the major concerns for the world which spread by mosquito bites or by sexual contact with an infected individual. In this viral infection symptoms are generally mild and nonspecific. The main concern is the potential of this disease. Dengue is another mosquito borne viral infection. Subsequent infection of this disease with different stereotype can cause life-threatening haemorrhagic fever. Chikungunya viral infection is also a new widespread disease in Asia. The symptoms of this disease is also

similar to those of Dengue. It can cause a post viral chronic inflammatory rheumatism in most of the cases. Vector borne diseases are generally reported between mid-July and November end. Dengue and chikungunya are caused by mosquitoes which breed in clear water while Anopheles mosquito which because malaria can breed in both fresh and muddy water.

The occurrence of VBDs depends on the interaction of various biological, ecological, social and economic factors. Distribution of VBDs is determined by complex demographic, global travel and trade, social factors, unplanned urbanization and environmental challenges such as variation of temperature and rainfall. The

most widely reported disease is malaria with annual occurrence of 300-500 million cases and 1.1-2.7 million deaths globally. Another most widely known disease is dengue. India alone bears 34% infection of the global total. These diseases such as Dengue, Malaria and Chikungunya have been increasingly reported in the country. Assessment of Knowledge and practices of community about prevention of VBDs is important for designing community-based interventions. In this era of globalization surveillance is an important factor in controlling VBDs. In this review the different surveillance and monitoring methods were assessed to evaluate their potential for controlling these VBDs and supporting public health plans and strategies.

Impact of climate change on distribution of vectors and vector borne diseases:

Climate change is responsible to alter the geographical and seasonal occurrence of existing vectors and vector borne diseases and also affect the new emergence of Vector borne pathogens. Rising temperature, changing precipitation pattern and a higher frequency of some extreme weather events associated with climate change will affect the distribution, abundance and prevalence of infections in the mosquitoes that transmit pathogens. Which in turn will influence human exposure to bites from infected mosquitoes.

The vector, responsible for transmission of pathogens are sensitive to climate change and environmental factors which influence the reproduction, development, activity, replication, distribution and abundance, maintenance and transmission of vectors. The climate changes also affect the vector-host survival and its population size and density which in turn increases the frequency of vector born disease outbreak and its onset with seasonal variation. Apart from these climatic factors there are some environmental and social factors are also responsible for transmission and infection pattern of these vector borne diseases. These factors are availability of host, changing ecosystem, human behaviour and adaptive capacity, adaptance and changes in pathogens.

The growth of urban slums, poor sanitary condition and waste management can also increase the risk of viral diseases spread by mosquitoes. The other factors responsible for these Vector borne diseases in India are poorly designed irrigation and water systems, inadequate housing, poor waste disposal, water storage, deforestation and loss of biodiversity.

Preventive measures from Vector Born Diseases:

Successful vector born disease prevention is the result of proper management of control strategies and elimination of vector population. Consistent

failure of vector control program in India is due to lack of coordination among scientist and program manager, inadequate resources and lack of intersectorial co-operation.

The most fatal vector born disease, malaria kills 1.2 million people annually mostly children under age five. Dengue fever is also the world's fastest growing vector born disease. Now WHO designed Integrated Vector Management (IVM) for prevention and control of these vector born disease. It is designed to achieve the greatest disease control benefit with minimum negative effect on ecosystem. It decreases the side effect on public health from the excessive use of chemicals in vector control. IVM promote environmental management strategies that can reduce vector breeding sites as well as use of biological control (e.g. bacterial larvicides and larvivorous fishes) that target and kill vector larvae without causing depletion of biodiversity.

The Global vector control response (GVCR) 2017–2030 approved by the World Health Assembly (2017) provides strategic guidance to countries and development partners for urgent strengthening of vector control as a fundamental approach to preventing disease and responding to outbreaks.

In India National Vector borne Disease Control Programme (NVBDCP) has been designed for prevention of control of six VBDs like Malaria, Dengue,

Lymphatic filariasis, Kala-Azar, Japanese encephalitis and chikungunya. It is a part of technical division of directorate general of health services, Gov. of India equipped with technical experts in the field of public health, Entomology, Toxicology and parasitological aspect of Vector borne diseases. It is responsible for framing technical guidelines and policies to control these diseases and also check the proper implementation of these strategies for complete eradication of diseases from India.

A major element in Vector borne diseases is behavioural changes. It is essential to provide education and improve awareness among people so that they can protect themselves and their communities from these fatal diseases. WHO work together with many government sectors to control these diseases? For prevention people need to protect themselves from bites of mosquitoes, mites and ticks and also prevent their proliferation. Some preventive measure are as follows:

1. Protect themselves from the bites of vectors by using insect repellent like DEET and picaridin on exposed part of body
2. Prevent accumulation of stagnant water
3. Control vector and reservoir of diseases
4. Disposal of garbage properly.

The best prevention is to educate individual on how to reduce vector population in their community.

Need for further Research:

On the basis of review of emerging trends of these vector borne diseases there is a great demand of scientific research for the areas of vector borne disease activity. As we discussed earlier that climate factors play a significant role in the emergence of these diseases but still the mechanism of these processes are poorly understood. There is a need of research on these particular area like vector host interaction, host immunity, pathogen evolution, socio-economic drives of transmission and human behaviour and adaptive capacity for the better understanding of the mechanism by which climate and non-climatic factors drives vector borne disease emergence.

We have to monitor responses of pathogens to climate change and enhance systematic long term surveillance datasets on vector and pathogens distribution. This collected datasets will provide a better understanding of vector occurrence, abundance and its infection rates. We need to study the natural maintenance cycle of vector borne pathogens, its emergence and transmission as well as how climatic factors

affect these cycles.

Conclusion:

The key elements involved in humans' vector borne diseases are the infectious pathogens (virus, bacterium or parasites), the vector (mosquitoes, tick and fly) and the reservoir from which the vectors obtain the infection. (Armstrong & Rico Hesse, 2001). Control strategies for these diseases depends on the understanding of the complex dynamics of vector- host interaction and the ways in which the environment of both the host and vector interact to produce human diseases. There is a great need to create a balanced, integrated, basic and applied research agenda to study the challenges and issues associated with vector borne disease control efforts. Integration of information management surveillance and well-equipped laboratory for research are essential for the control and prevention of vector borne diseases. Communication and collaboration among National agencies involved in vector research is essential for the successful implication of controlling strategies of vector borne diseases.

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