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Editorial

Changing facet of medical entomology: Where do we stand?

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The globe recently witnessed the SARS CoV2 epidemic, whose primary cause has been linked to zoonosis. In a similar vein, there have been several vector-borne illnesses that have emerged and reemerged globally. In this context, some experts, including Soumya Ranganathan, felt that India needed more entomologists. This was because recently discovered illnesses, such as zika (which is spread by the same kind of mosquito that causes dengue) and scrub typhus (which is spread by a mite), go mainly undetected in India.[1–3]

Numerous writers and scientists expressed their opinion that the rise in dengue cases is a result of climate change and global warming. A change in the weather is making it possible for dengue to spread to previously unaffected areas, infecting more individuals and necessitating immediate public health action to provide shielding measures.

Medical entomology is an important and relatively complex field in preventive healthcare. It deals with the insects that carry diseases, called vectors, and how they spread them. These diseases, which can have serious consequences for people's lives and livelihoods, include elephantiasis, malaria, lymphatic filariasis (LF), and kala-azar. In India, most newly discovered infections like zika—which is spread by the same species of mosquito that causes dengue—and scrub typhus—which is spread by a mite—go undetected. We can no longer afford to ignore this field.

After a 65-year hiatus, scrub typhus is making a comeback in certain parts of India.[4] All around the nation, sporadic instances have been documented, even in areas where scrub typhus has never previously occurred.[5–7] In 2022, 6,430 cases of dengue fever were reported, resulting in 8 fatalities. Tamil Nadu, the state, recorded 4,048 cases of dengue in the previous eight months and fifteen days in 2023.

Changes in the climate, agricultural methods that support mite growth, urbanization, the movement of sick individuals, and heightened awareness among medical professionals could all be contributing factors to this revival.

Research has shown that the emergence or reemergence of these diseases is largely determined by the interactions that occur between pathogens, hosts, and the environment. Furthermore, there is strong evidence linking the origin and/or resurgence of vector-borne diseases to socioeconomic and demographic variables as urbanization, globalization, trade, travel, and intimate relationships with livestock.

Other studies highlight the main aggravating factors for the establishment and reemergence of vector-borne infectious diseases as the continuous evolution of infections, the growth of reservoir populations, and the usage of antibiotic drugs. Certain research, however, categorically assert that vector-borne infectious disease emergence and comeback are related to climate change.

Our ability to prevent the numerous newly developing and resurgent vector-borne infectious diseases that may

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occur in the future appears doubtful, even if many significant emerging and re-emerging vector-borne infectious diseases are becoming better controlled.

Other studies emphasize the ongoing evolution of pathogens, proliferation of reservoir populations, and antimicrobial drug use to be the principal exacerbating forces for emergence and re-emergence of vector-borne infectious diseases. Still other studies equivocally claim that climate change has been associated with appearance and resurgence of vector-borne infectious diseases.

Despite the fact that many important emerging and re-emerging vector-borne infectious diseases are becoming better controlled, our success in stopping the many new appearing and resurging vector-borne infectious diseases that may happen in the future seems to be uncertain.

Man power

In an article by Anuja Pandey on Demand–supply gaps in human resources to combat vector-borne disease in India: capacity-building measures in medical entomology they reviewed the capacity-building initiatives in medical entomology in India, to understand the demand and supply of medical entomologists, and to give future direction for the initiation of need-based training in the country.[2] In this it was observed that approximately 52,455 medical undergraduates annually, across 400 medical colleges in India[3] imparted knowledge regarding Medical entomology as part of preventive and social medicine. As per 2015 statistics MD student output was 786 in 229 medical colleges and 90 DPH and 11 DCM candidates. As we all aware that there is drastic increase in both UG and PG Seats.

Entomology is essential for the eradication of disease in the face of issues like insecticide resistance and the impact of climate change on mosquito behavior. Understanding disease patterns and vector behavior is crucial for prevention, even though cutting-edge diagnostics and therapies are also needed. When trying to eradicate diseases, entomologists can offer important insights into how insects behave, how species vary and undergo genetic changes, and where to find breeding grounds.

However, it is doubtful if the curriculum addresses these recent issues, allowing students to comprehend the effects of genetic mutations on vectors that lead to an increase in resistance to the pesticides used to control vectors and the subsequent spread of diseases.

Collaborative research and vector control strategies

In India, community health doctors and microbiologists have little to no influence over the ground control of vector-borne illnesses. Either insecticide-based control or environmental management predominates when it comes to vector control. However, there is little research on the effects of pesticide resistance and climate change, as well as on newly emerging and reemerging infections and the role that zoonosis plays in their emergence. The majority of collaborative research is also restricted to prestigious institutions, and studies involving many departments at private medical universities ought to involve physicians, who can provide important insights into the study.

An AI-based strategy for improved surveillance: At local to global scales, artificial intelligence (AI) can be a significant factor in improving arbovirus surveillance. Large amounts of data, including entomological, epidemiological, and environmental data, can be analyzed by AI systems. Enhancing pattern identification and producing probabilistic risk models for outbreak spread and severity can be achieved by combining human, pathogen, vector, and climate information from multiple current monitoring sources into a single, unified system.[8]

This makes it possible for epidemiologists to employ high-throughput methods like metatranscriptomic sequencing to more precisely identify trends, forecast outbreaks, and guide targeted interventions.[9] Therefore, it is imperative that medical professionals use their expertise to grasp not only the range of diseases and their causes, but also the part that modern technologies play in disease control. AI can also help with modeling, enhance data integration, automate data processing, and offer real-time monitoring and analysis of numerous variables. Because of this, public health authorities are better equipped to detect high-risk locations, distribute resources more effectively, and respond in a proactive and efficient manner.[8,9]

Conflict of Interest

None.

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