



E-ISSN: 2320-7078

P-ISSN: 2349-6800

www.entomoljournal.com

JEZS 2024; 12(1): 82-86

© 2024 JEZS

Received: 05-10-2023

Accepted: 06-11-2023

Shruthy NV

Department of Vector Biology & Control, ICMR-RMRIMS, Patna, Bihar, India

Akansha Goldi

Department of Vector Biology & Control, ICMR-RMRIMS, Patna, Bihar, India

Dr. Ajay Kumar

Department of Vector Biology & Control, ICMR-RMRIMS, Patna, Bihar, India

Corresponding Author:

Dr. Ajay Kumar

Department of Vector Biology & Control, ICMR-RMRIMS, Patna, Bihar, India

Post graduate program in public health entomology: A new horizon of capacity building for fighting against vector borne disease in India

Shruthy NV, Akansha Goldi and Dr. Ajay Kumar

DOI: <https://doi.org/10.22271/j.ento.2024.v12.i1b.9280>

Abstract

Arthropod borne vector borne diseases have been one of the greatest concerns relating to global health. More than a million people are affected annually across the globe, making these infamously responsible for covering a major proportion in the rates of mortality and morbidity, especially in the tropical environments. In order to bring the alarming situation of VBDs into consciousness and control, the World Health Organization called to recommence efforts in this regard in the year 2014. The awareness theme included the slogan “small bite, big threat”. Obviously, to lead the population into growing stable health, a healthier public health system is equally important as healthcare. Further, for a successful public health system, human resource forms link to turn thoughts and missions into promising outcomes. Pertaining to this, medical entomologists play a crucial role in checking the transmission of vector borne diseases which are degrading world health as a whole, including country India. Here, the paper emphasizes on capacity development initiatives in the field of public health and medical entomology in our country, thereby improving and strengthening resources and skillset. The reduced count of public health entomologists in India indicates that there is a wide gap between need and the availability. To tackle the outbreaks caused by vector borne diseases in the country, this gap needs to be filled immediately. Considering this scenario, Indian Council of Medical Research has initiated a post graduate program in public health entomology. This is a two-year full-time class room as well as field-based program which has been introduced at five centers in different locations of the country. The determined approach to develop capacity in the field of medical entomology would benefit in providing new, collaborative study work, observations, and ideas for research in vector biology and in turn implement inferences gained from them for proper control of vectors and prevention of VBDs. The vision also adds up to promoting and expecting public health entomologists as an asset in vector control programs, both nationally and worldwide for certain times to come in the future.

Keywords: Public health entomology, arthropod vectors, vector borne disease, capacity building, post-graduation

Introduction

Since earlier times, vector born diseases overlap a significant percentage of infectious diseases. The geographical distribution of about seventeen percent is mainly confined in tropical and subtropical areas. The occurrence of VBDs is strongly influenced by environmental conditions, demographic segregation, and socio- economic factors. For example, the vectors of Malaria, Dengue, Chikungunya, Filariasis, Zika, Kala-Azar, and Japanese Encephalitis form a key component of disease transmission in various eco-settings where climate favors their growth.

Also, some other vectors like fleas, ticks and mites gives rise to a number of emerging diseases such as Crimean Congo Hemorrhagic Fever (CCHF), Kyasanur Forest Disease (KFD), rickettsiosis and scrub typhus ^[1, 2, 3]. The extent of vector borne diseases is subject to vary with expansion in range of vector species, including shifts, resistance to insecticides, change in distribution of population and resources due to anthroponotic activities ^[4]. Currently, there are mainly six vector borne diseases impacting public health in India. These are Lymphatic Filariasis, Malaria, Dengue, Japanese Encephalitis, Chikungunya, and Kala-Azar which attributes for hampering public health sector by not only increasing mortality and morbidity but have also influenced the quality of lives among common people highly ^[5]. In areas like edges of desert etc, cutaneous leishmaniasis may be found.

‘Such places are commonly called silent zones of diseases’ and will only be brought to light when susceptible human gets infected by direct or indirect contact with them [6]. On the other hand, many similar places could be found with proper ecological awareness and adequate knowledge. Entomologists form a central step for achieving this aspect of progress. By studying various aspects of the vectors, the entomologists are able to develop tools and control measures against these vectors. These measures are mainly focused on their bionomics, ecology and behavior of vector species. The target is to achieve a declination in vector breeding, thus reducing the vector density and their ability in disease transmission. This kind of prior information is essential for successful elimination program in any region.

Entomologists are crucial – but hard to find

An argumentative statement: “We are targeting elimination of vector borne diseases without entomologist”. Let’s answer, who is an entomologist, working at SEARO or other regional offices. Endless discussions went on. Some ad hoc measures were initiated, but it was concluded that it is only for mosquito collection which is not the actual entomological study [6]. The National Malaria Control Organization, in Delhi was set up in 1958 or so, with Dr AP Ray as Director who did a tremendous job in introducing DDT for indoor residual spraying. The program was able to cover almost 100% of the Indian villages. Entomologist played an integral plus realizing role in malarial disease control in those days. They worked hard in the field. Henceforth, malarial cases reduced drastically resulting in NMCP becoming NMEP. This eradication era started in the sixties itself. But, there occurred a misconception among the bosses that DDT can replace entomologists, after which, they were slowly but steadily neglected. This led to doom in coming years. The real challenge came up when the mosquitoes slowly began to develop resistance against available insecticides; they showed changes in their behavioral patterns including the resting, biting and breeding behavior [6, 7]. Actually, the entomologists would have monitored them, but before that they were shunted. Due to certain pitfalls in the control operations, soon the mosquitoes developed resistance to insecticides like DDT. It would have been possible to find a solution to this serious problem if there had been a constant entomological surveillance and research. But there were no entomologists at that time being [6]. Operational research in the field was essential to handle the situation. But instead of field studies, the research organizations started molecular research. Fieldwork was replaced by laboratory work in air-conditioned rooms. Even though there were new educational courses that produced medical entomologists, those who passed the institution were not getting jobs and those getting jobs were absorbed in non-vector control activities.

Entomologists determine appropriate vector control tools and interventions for effective control of the same in transmission as per the disease, concerned vector, resources grasped according to quantity and quality, time management etc. It has been vividly shown throughout the malaria control program, right from the commencement of indoor residual spraying with DDT, to the use of LLIN [8]. The Asia - Pacific regions including countries like Korea, Thailand, Mongolia, Singapore, Nepal etc are also in need of competent entomologists in vector control program as well as research.

A sense of much needed action to the current situation had arise as these posts have been unoccupied for a long time

across region. The lack of investment in the long-term career development of entomologists is one of the reasons [6]. At a group meeting held by National Malaria Control Program (NMCP), a representative said: “Entomologists are now a rare species. Before malaria elimination, the elimination of entomologists has now begun. Entomologists in the field are now doing administration and paperwork of their departments, rather than conducting insect studies. This is not what they have been trained for.” This clearly indicates urgent doubts on the sustainability of the NMCP and its upcoming program towards malaria elimination and beyond. The situation is not so much different in cases of other vector borne diseases. Therefore, an insufficiency in the number of qualified entomologists in the related field must be acknowledged immediately for implementation of control program to further act on prevention, control, creating awareness around VBDs.

c. Public Health Entomology (MPHE): A new horizon of capacity building for fighting against vector borne disease

At the hour and in moment, qualified entomologists are needed for effective implementation of vector control and management program catered at each and every level: global, national, regional. In the country, the national program has envisaged zonal teams for surveillance and monitoring of VBDs for betterment and an easier coordination of control program. Besides, we do have entomological team districts level in all states and union territories for carrying out the agenda in a suited manner. Currently, there are only 36 zonal entomological units functioning in 12 states. On contrary, the harsh truth regarding this initiative is that there is no single entomologist in place across these specific zones [5]. Further, almost all the countries with endemic VBDs, the entomological realm has dwindled over the years, and this fact has been prominently articulated in the Global Vector Control Response (GVCR) document released by WHO [9]. Through GVCR (2017-2030) WHO had advised all the VBD associated countries to increase their entomological capacities and strengthen the existing ones at all levels, thus, reducing the aforementioned gap between the demand and existing availability of such trained human resources. Hence, a boost is expected from several hundreds to few thousands in forthcoming years. In this sphere, qualified medical entomologists with adequate knowledge and training in vector biology, population biology, ecology and epidemiology of vector borne diseases become a necessity to solve issues in public health sector for the existing population and for generations to arrive.

There are a total of 766 districts in India, and there ought to be at least 2 trained entomologists with expertise in each district. For example, there are sporadic cases of Kala - Azar being recorded in other parts of India excluding endemic states. For addressing such kind of situations, there is a growing insufficiency of trained public health entomologists throughout the country. The situation is not so much different at global level. Likewise, the World Health Organization (WHO) attributed to south Asia pacific region, the number of trained entomologists are very few and countable at finger tips. Nowadays, the pupil’s interests are shifting from core subjects like entomology to other such as biotechnology, molecular biology and genetics. In addition, universities are focusing on entomology from their agricultural perspective than medical, the curriculum to which completely lacks the domain of vector borne disease and public health. With an

aim of erasing these unwanted limits to medical entomology, the ICMR has committed to produce a total of 100 public health entomologist per year. The main objective is to address the existing vacancies and need in the ensuing years to come up with the actual requirement for vector borne disease control in our country, also extending to South East Asian region.

National Centre for Disease Control (NCDC), National Centre for Vector-Borne Diseases Control (NCVBDC), National Health Mission (NHM), the ICMR Institutes (VCRC, NIRTH, RMRIMS, NIMR and RMRCs) and state health departments also require personnel with knowledge in entomology and epidemiology to carry out vector control and related research in adequate capacity. Keeping it in viewpoint, a M.Sc. course in Public Health Entomology (PHE) had been introduced at VCRC since 2011. From the academic year 2022-2023, ICMR additionally introduced the same post-graduate course in Public Health Entomology at four other Institutes under ICMR. 1. ICMR-National Institute for Research in Tribal Health, Jabalpur (Madhya Pradesh) 2. Regional Medical Research Centre, Gorakhpur (Uttar Pradesh) 3. ICMR-Rajendra Memorial Research Institute of Medical Sciences, Patna(Bihar) 4. Regional Medical Research Centre, Dibrugarh (Assam). All of these institutes are affiliated to Pondicherry University (Puducherry) for awarding this post graduate degree in Public Health Entomology [Table 1]. The selection of students will be under different categories. Under category I an all India level computer-based entrance examination is conducted at all the five study centers. ^[10]. The candidates selected through entrance exam (Category-I) will be given a scholarship of 20,000Rs (\$240.00)- monthly. The candidates, who will be selected under Category-II (In service candidates nominated by govt. sectors) will be given a stipend of Rs. 10,000/(\$120.00)- every month (it is awaiting for approval from ICMR, New Delhi. The stipend is meant not only to attract talented students but also to take care of the meritorious socioeconomically disadvantaged students and to bring them to the forefront. Recently, ICMR-VCRC has laid foundations for an International Centre of Excellence for Training in Medical Entomology (ICETIME) to achieve the goal of forming manpower trained in the field of public health entomology at all geographical and regulatory levels. ^[10]. ICETIME will provide post-graduation degrees, certificate courses and formal as well as informal training in public health entomology. The center will help to strengthen efforts

of the national program in the respective countries of Southeast Asian and African region. M.Sc. in PHE is a unique course in India that would meet entomological needs nationally and internationally.

The course exposes students to interact with experts in the field helping them to have specific knowledge of entomology affecting medical health. The students are also trained for utilizing modern approaches in altering VBDs epidemiology through prevention and control of vectors. Arthropods affect human health and well-being in somewhat direct or indirect ways. It effects directly by transmitting infectious diseases and indirectly by affecting the essential things and resources necessary for survival of human beings viz. agriculture, and other important industries. The MPHE course gives an overview on arthropods as vectors and the ways in which they make human health suffer, paying it an equal importance globally. An epidemiological background is going to be an aid in the syllabus throughout. Education in vector biology along with ecology will be in detail. As a result of which, students would be familiar with the basics of arthropods affecting lives and people. Knowledge about the arthropod- borne diseases will help in identification of vector-host-pathogen relationship, conduct epidemiological studies of vector-borne diseases, surveillance and diagnosis of vector-borne diseases by application of modern tools and approaches, design suitable control and preventive measures comprising rationalized use of pesticides. The Category –II candidates; in-service candidates, who are nominated by government sector will get hands-on training as well as academic degree in this highly specialized course. After completion of this course, they will be able to give tremendous output in their respective department by implementing their advanced knowledge of bionomics and surveillance of vectors. A formal placement cell has been instituted in the ICMR-VCRC, Puducherry for promoting career opportunities to the passing out students from both categories I and II in M.Sc. public health entomology. The study program has been constructed in such a way that the knowledge and perspective gained by the students will lead them to potential practice of resources making vector control program easier, affordable, reliable and authentic. Students will be provided with an opportunity to acquire skills for precise functioning of operational program and yield sustainable results for Integrated Vector Management.

Table 1: List of ICMR institutes offering 2 years Post Graduation in Public Health Entomology

S. No.	Name of ICMR Institute	Website	Research Area	Course	Affiliation	Intake
1.	ICMR- Vector Control Research Centre, Puducherry.	ICMR-VCRC https://vcrc.icmr.org.in/	Lymphatic Filariasis, KFD, Insecticide Resistance	M.Sc. (Public Health Entomology)	Pondicherry University, Puducherry	20
2.	ICMR- National Institute for Research in Tribal Health, Jabalpur, Madhya Pradesh.	ICMR-NIRTH https://www.nirth.res.in/	Malaria, Insecticide Resistance	M.Sc. (Public Health Entomology)	Pondicherry University, Puducherry	08
3.	ICMR- Regional Medical Research Centre North East Region, Dibrugarh, Assam	ICMR-RMRCNE https://rmrcne.org.in/	Mosquito borne diseases, Trematode infection, Insecticide Resistance	M.Sc. (Public Health Entomology)	Pondicherry University, Puducherry	06
4.	ICMR- Regional Medical Research Centre, Gorakhpur, Uttar Pradesh	ICMR-RMRCGKP https://rmrcgkp.icmr.org.in/	vector borne diseases like JE, Dengue, and filariasis, Insecticide, Resistance	M.Sc. (Public Health Entomology)	Pondicherry University, Puducherry	10

5.	ICMR-Rajendra	ICMR-RMRIMS	Visceral Leishmaniasis,	M.Sc. (Public	Pondicherry University,	16
	Memorial Research institute of Medical Sciences, Patna, Bihar.	https://www.rmrimis.org.in/	Sand Fly Vector Control, Insecticide, Resistance Other vector borne diseases like JE, Dengue.	Health Entomology)	Puducherry	
Total						60

Conclusion

Government of India has taken so many measures for vector control. As a part of those initiatives, 72

entomological zones were created in the country, with provision for district level entomologist for entomological surveillance and effective program implementation across the country [5]. However, a large number of posts for entomologists stay vacant in many states of India from a long time. Considering the present situation, it is expected that the post graduate program in public health entomology initiated by the ICMR will create pools of trained entomologists who could be directly deputed in national vector borne disease control programs. This scope will also be open to the South East Asia, African and other countries to enrich their national program in the region. This course will pave way for meeting the requirements of WHO's GVRC goals of vector control capacity development and enhancing the growth of program in the country.

Training in public health entomology in a medical institution program has only reserved a small part. Referring to the enormous population which the country has till now, training programs and the enrolment capacity comparatively remains low. Moreover, the vector borne disease patterns are changing with respect to changes in geographical, seasonal and severity. Therefore, prevention of vector-borne diseases requires an organized approach due to its complexity. The upcoming changes in pathogens, vectors and transmission pattern also require an advanced, genuine and rapid response. These could be possibly achieved with entomologists having specialized skills. Currently, medical entomology lacks sub-special courses. Courses such as vector biology, VBDs transmission dynamics and advancing technologies should be introduced in this field. Courses in subspecialties would create possibilities for future and longevity. Also, concept for disease-specific specialized courses can be put forward for countries prone to VBDs. Doctoral (PhD) courses are also essential in relation to field aspects of medical entomology as the course focuses mainly on research, which may not be ample enough to put together candidates for the control of vector-borne diseases at field level. The scarcity of experts and trained manpower in medical entomology can also be solved via other ways of distance learning that can help more candidates to participate in surveillance and awareness programs. With a considerable increase of human capacity, attention is required to maintain and improve the quality of existing resources along with their conduct and outcome. This can be achieved by a better grasp of curriculum and training techniques. Many trained medical entomologists opt for a career in applied fields. They prefer working on molecular biology, biotechnology or microbiology, rather than on entomological aspects. Public Health Entomology as a career should be made more comprehensive and alluring by energizing their role. They must be handed an independent and realistic position into public health system associated with technology applications. They should also be made a part of Geographic information systems and included in data

management to find the valuables of vectors. This may lead to building and deployment of new design and interventions [11]. Human Resource and institutional capacity go hand in hand. Both are interrelated and interdependent. So, along with human resources, building institutional capacity is also an important part of capacity building. In present times, few organizations are taking steps in this regard. Still, attention must be paid to honor and fulfill long term shortage of public health entomologist in the country. Undoubtedly, Public Health Entomology is sincerely focused on vectors of disease pathogens. But, contrary phenomenon of travelling, climate change etc. is likely to lift up the counts of vector borne diseases. Now, a public health entomologist needs to be ready to face new challenges and respond to future threats. Lastly, MPHE is an engaging drive by the ICMR to encourage as well as help aspire students/graduates for working towards a steady future in a community context. This being not only theoretical but creative on practical grounds and inclusively responsible for health of people; public health; health for all!

Acknowledgement

All Authors give great thanks to the Indian Council of Medical Research (ICMR), New Delhi and Pondicherry University, Puducherry for financial and admin support to this capacity building course in the field of Public Health Entomology. This study was supported by ICMR, New Delhi grant for new schemes entitled, "Multi-centric project proposal for M.Sc. Public Health Entomology (MPHE) Program (2022-25)".

Conflicts of Interest

The authors declare that there are no conflicts of interest with the contents of this article.

References

- Giribet G, Edgecombe GD. Reevaluating the arthropod tree of life. *Annu Rev Entomol.* 2012;57:167-86.
- Mathison BA, Pritt BS. Laboratory identification of arthropod ectoparasites. *Clin Microbiol Rev.* 2014;27:48-67.
- Simon F, Savini H, Parola P. Chikungunya: A paradigm of emergence and globalization of vector-borne diseases. *Med Clin North Am.* 2008;92:1323-43, ix
- Bhattacharyya H, *et al.* Trend of emerging vector borne diseases in India: Way forward. *Int J Community Med Public Health.* 2022 Jun;9(6):2730-2733.
- National Centre for Vector Borne Disease Control <https://ncvdbc.mohfw.gov.in/index4.php?lang=1&level=0&linkid=407&lid=3683>
- Rajgopalan PK. Medical Entomologists - A Disappearing Profession in Public Health System: Indian Perspective. *J Commun Dis.* 2022;54(1):161-165
- Sokhna C, Ndiath MO, Rogier C. The changes in mosquito vector behavior and the emerging resistance to

- insecticides will challenge the decline of malaria. *Clinical Microbiology and Infection*. 2013 Oct 1;19(10):902-7.
8. Pandey A, Zodpey S, Kumar R. Demand-supply gaps in human resources to combat vector-borne disease in India: capacity-building measures in medical entomology. *WHO South-East Asia Journal of Public Health*. 2015 Jan 1;4(1):92-97.
 9. GVCR-WHO
<https://www.who.int/publications/i/item/9789241512978>
 10. ICMR-VCRC, Puducherry,
<https://vcrc.icmr.org.in/manpower-development/msc-phe/about-msc-phe-and-ph-d>
 11. Mnzava AP, Macdonald MB, Knox TB, Temu EA, Shiff CJ. Malaria vector control at a crossroads: public health entomology and the drive to elimination. *Trans. R. Soc. Trop. Med. Hyg.* 2014 Sep;108(9):550-4. doi: 10.1093/trstmh/tru101. Epub 2014 Jul 9. Review. PubMed PMID: 25009173.