

REVIEW ARTICLE

LYMPHATIC FILARIASIS VECTORS IN SOUTHEAST ASIAN: A SCOPING REVIEW PROTOCOL

Mohd Amiru Hariz Aminuddin, Faizul Akmal Abdul Rahim, Mohd Amierul Fikri Mahmud, Khairul Aizat Mahdin, Mohd Hazrin Hashim

Institute for Public Health, National Institutes of Health, Ministry of Health Malaysia

*Corresponding Author Email: amiruhariz@moh.gov.my

This is an open access journal distributed under the Creative Commons Attribution License CC BY 4.0, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited

ARTICLE DETAILS

Article History:

Received 10 October 2025
Revised 15 November 2025
Accepted 19 December 2025
Available online 16 January 2026

ABSTRACT

Lymphatic filariasis (LF) is a neglected tropical disease affecting millions, with Southeast Asia (SEA) remaining a high-risk region despite significant global reductions. The World Health Organization (WHO) has set 2030 as the target for LF elimination. However, accomplishing this goal in SEA requires comprehension of the distribution, ecology, behavior, and competency of LF vectors, which are crucial for formulating effective control strategies. This comprehensive scoping review, the first to compile all existing data on LF vectors across the SEA region, aims to elucidate distribution, ecological and behavioural patterns, and vector competence. The findings will be used to identify knowledge gaps and develop targeted vector control measures, thereby contributing to the regional and global elimination of LF.

KEYWORDS

Lymphatic filariasis, Southeast Asia, mosquito vectors, vector ecology, vector competence, scoping review

1. INTRODUCTION

Rearing small ruminants Lymphatic filariasis (LF) Lymphatic filariasis (LF) is a neglected tropical disease in tropical and subtropical areas (Davis et al., 2019 ; Ottesen et al., 1995). Spread by mosquitoes, LF is caused by parasitic worms that affect both humans and animals (Evans et al., 2024). These worms, including *Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori*, are transmitted by various mosquito species, such as *Aedes*, *Anopheles*, *Culex*, *Armigeres*, and *Mansonia*, which differ geographically (McNulty et al., 2013 ; Famakinde, 2018 ; Pedersen et al., 2002 ; Bockarie et al., 2009 ; Stone et al., 2014).

Mosquito bites transmit larvae that mature into adult worms inside the lymphatic vessels, releasing microfilariae that harm the lymphatic system (Paily et al., 2009 ; Nanduri et al., 1989). This leads to lymphoedema, elephantiasis, and scrotal swelling (hydrocele), causing significant clinical morbidity. While rarely fatal, LF causes mental health issues, stigma, and economic hardship (Ramaiah and Ottesen, 2014 ; Obindo et al., 2017 ; Leang, 2004).

In 2023, the WHO estimated that 657 million people in 39 countries needed preventive chemotherapy for LF. LF has led to chronic hydrocele in 25 million men and lymphedema in over 15 million people globally, leaving at least 36 million individuals affected (World Health Organization, 2024).

LF heavily affects Asia, with 70% of global cases in India, Nigeria (Africa), Bangladesh, and Indonesia. Many other Asian countries are also at risk. In 2022, SEA had the highest LF burden globally, accounting for most lymphedema and hydrocele cases. This region represents over half the global LF burden, including 5.1 million disability-adjusted life years lost, and has the most endemic countries (World Health Organization Regional Office for South-East Asia, 2013).

In recognition of the significant worldwide burden of LF, WHO established the Global Programme to Eliminate Lymphatic Filariasis (GPELF) in 2000,

aiming to eliminate LF by 2020 (Ichimori et al., 2014). While WHO reported a significant 74% reduction in lymphatic filariasis (LF) infections in 2018, over half a billion people remain at risk, pushing the global elimination target to 2030 (Malecela and Ducker, 2021).

Disease control relies on both symptom management and mass drug administration, employing a triple therapy of albendazole, diethylcarbamazine (DEC), and ivermectin (Irvine et al., 2017 ; Turner et al., 2017 ; Utzinger et al., 2010). While MDA is a valid intervention strategy, the possible emergence of drug-resistant microfilariae, drug inactivity against adult worms, and diverse treatment responses across and within species should be considered.

As plans to eliminate LF in SEA continue, we must outline both the progress and research of the past that will give a vision into research gaps and new directions that may assist in achieving our goals (Shirley et al., 2023).

2. RATIONALE

The WHO's revised target to eliminate LF by 2030 underscores the urgency of addressing persistent gaps in vector surveillance and control, particularly amid challenges such as drug resistance and emerging ecological shifts. Effective vector control relies on knowing the distribution, ecology, behaviour, and vector competence of different mosquito species. Collecting site-specific data on mosquito vectors represents a fundamental step in planning vector control measures.

As the first scoping review protocol designed to consolidate existing knowledge on LF vectors across SEA, this scoping review protocol aims to identify the distribution, ecological factors, behavioural patterns, and vector competence of LF-carrying mosquitoes across SEA, consolidate existing evidence, identify knowledge gaps, and provide actionable insights for tailored vector control measures. This effort is anticipated to support ongoing regional elimination initiatives and contribute to global LF eradication efforts.

Quick Response Code



Access this article online

Website:
www.actascientificamalaysia.com

DOI:
10.26480/asm.01.2026.15.18

3. OBJECTIVE

This review is driven by the following objectives:

- To systematically identify and extract evidence on the distribution, ecology behavior, and vector competence of lymphatic filariasis vectors across SEA countries.
- To map the geographical and ecological distribution of lymphatic filariasis vectors in SEA, and highlight regional variations.

In this review, we aimed to collect and analyse data concerning LF vectors in SEA countries by searching publications recorded in PubMed, Embase, and Scopus.

4. MATERIAL AND METHODS

This study is a review of secondary sources and, therefore, exempt from review by the Human Research Ethics Committee. Nonetheless, this study protocol was registered with the National Medical Research Register as NMRR ID-25-00571-QG9. This review will map existing research on the topic using a systematic approach, following PRISMA-ScR guidelines (Tricco et al., 2018; McGowan et al., 2020).

This framework comprises a 22-item checklist that encompasses various aspects, including eligibility criteria, search strategy, screening, and data organization strategy, with two additional optional elements: a summary of evidence and a critical appraisal of sources. This scoping review will follow Joanna Briggs Institute (JBI) guidelines (Aromataris and Riitano, 2014).

A protocol was created beforehand to enhance research value and minimize waste, as recommended for scoping reviews (Aromataris and Munn, 2020). Data extraction and synthesis will be completed by December 2025, and results are expected to be available by Mac 2026.

Table 1: PCC framework	
Context that guided the research question	
Population	The study focuses on Lymphatic filariasis (LF) vectors (disease-transmitting mosquitoes).
Concept	Main investigation: Characteristics, types, distribution, or role of lymphatic filariasis vectors.
Context	Setting: SEA (the focus region for the literature mapping).
LF, Lymphatic Filariasis; SEA, South-east Asia.	

5. ELIGIBILITY CRITERIA

This review will exclusively focus on studies published between the year 2000 to the end of December 2024.

The review will include studies that meet the following criteria:

- Study Types: Primary research, including cohort, case-control, and cross-sectional studies.
- Publication Language: English.
- Study Period: Publications from January 2000 to December 2024.
- Geographic Scope: Studies focusing on countries within SEA countries, which includes Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam.
- Content Focus: Research addressing the distribution, ecology, behavior, and vector competence of lymphatic filariasis vectors, particularly Aedes, Anopheles, Culex, Mansonia, and Armigeres.

The following categories of evidence will be excluded:

- Systematic reviews, meta-analyses, or other review articles.
- Non-primary studies such as short communications, guidelines, or case reports.
- Articles without clear methodologies or study designs.
- Literature focusing on non-lymphatic filariasis vectors.
- Publications in languages other than English.
- Abstracts from posters, conference proceedings, or book chapters.

- Studies using modeling, simulation, or machine learning without field-based data.

Table 2: Eligibility criteria	
Inclusion criteria	Exclusion criteria
Study Types: Primary research, including cohort, case-control, and cross-sectional studies.	Systematic reviews, meta-analyses, or other review articles.
Publication Language: English. Study Period: Publications from 2000 to 2025.	Non-primary studies such as short communications, guidelines, or case reports.
Geographic Scope: Studies focusing on countries within South-East Asia.	Articles without clear methodologies or study designs.
Content Focus: Research addressing the distribution, prevalence, or ecological aspects of lymphatic filariasis vectors, particularly Aedes, Anopheles, Culex, Mansonia, and Armigeres.	Literature focusing on non-lymphatic filariasis vectors.
	Publications in languages other than English.
	Abstracts from posters, conference proceedings, or book chapters.
	Studies using modelling, simulation, or machine learning without field-based data.

5.1 Search Strategy

We will systematically conduct a literature search using different bibliographic databases. Electronic searches will be conducted from selected databases for eligible papers published until the end of December 2024. Databases such as PubMed, Embase, and Scopus will meticulously search using keywords: "filariasis" OR "elephantiasis" OR "lymphatic filariasis" OR "Brugia malayi" OR "Wucheria bancrofti" OR "Brugia timori" OR "Brugia pahangi" OR "lymphoedema" OR "lymphedema" OR "hydrocoele" OR "hydrocele" OR "microfilariae" OR "microfilaraemia" AND "vector*" OR "mosquito" OR "anopheles" OR "mansoniasis" OR "aedes" OR "armigeres" OR "culex" OR "coquillettidia" AND "South East Asia" as per S1 Appendix. The countries that will be included in the searches are Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam (World Population Review, 2024). Two main approaches for the search strategy include searching using medical subject headings (MeSH) terms and free-text terms in the title and abstract on databases. Boolean operators will be used to combine the search strings. Likewise, we will retrieve studies from advanced Google searches to discover grey literature sources, unpublished works, and ongoing trials related to the scope of this review.

Box 1: Search string
(lymphatic filariasis OR elephantiasis OR filariasis OR brugia pahangi OR brugia timori OR brugia malayi OR wucheria bancrofti OR microfilaraemia OR microfilariae OR hydrocoele OR hydrocoele OR lymphedema OR lymphoedema) AND (Coquillettidia OR Culex OR Armigeres OR Aedes OR Mansonia OR Anopheles OR mosquito OR vector) AND (Brunei OR Thailand OR Vietnam OR asean OR SEA OR South East Asia OR Timor OR Singapore OR Philippines OR Myanmar OR Malaysia OR Laos OR Indonesia OR Cambodia)

5.2 Screening strategy

The screening phase will commence following the removal of any duplicate records. It will involve two stages: title-abstract screening and full-text screening. Two review authors will independently examine the titles and abstracts of the references and will exclude all non-relevant studies. During the title-abstract screening phase, articles must meet the primary inclusion criteria and at least one of the secondary inclusion criteria. We will retrieve the full-text articles for the potentially relevant studies. Two review authors will then separately screen the full-text articles and will select studies for inclusion according to eligibility criteria and record the reason for exclusion of the excluded studies.

Ties will be broken by a third reviewer. For inclusion in the full-text analysis, all inclusion criteria must be met, and none of the exclusion criteria must be met. The primary author (MAHA) will contact the corresponding author of the publication via email to request access in cases where full-text articles are unavailable. We will record the selection

process and will complete the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram (PRISMA-ScR).

5.3 Data extraction process

We will employ a standardised data extraction framework to systematically capture the key attributes of published research literature, ensuring efficiency and consistency throughout the process. This framework will include vital bibliographic details, including titles, authors, publication dates/year, study objectives, study locations, research methodologies, sample sizes, language, and distribution of lymphatic filariasis vectors, and will be derived from tipsheet item no. 17: Results of individual sources of evidence in (PRISMA-ScR). Cooperatively, these components will provide a comprehensive summary of crucial study information, facilitating subsequent data analysis. Each article will undergo full reading by two reviewers, with conflicts resolved by a third reviewer. Data will then be imported into Microsoft Excel or Mendeley for storage, analysis, and summarization.

5.4 Presentation of the results

The PRISMA 2020 flow diagram will be fully utilised to illustrate visually all the processes and the progression of evidence across numerous study stages. We will gather a comprehensive synthesis of key findings for the distribution, ecology behaviour, and vector competence of LF vectors in SEA. All chosen evidence will be summarised in a tabular format (Appendix 4) to efficiently display source details, study attributes, and key findings. The data will be mapped to show regional variations. These findings will serve as a foundation for identifying future research opportunities and provide evidence-based information on lymphatic filariasis vectors in Southeast Asia.

6. DISCUSSION

To create a comprehensive overview, this scoping review will include studies published between 2000 and December 2024. The title-abstract screening phase is purposely structured to minimise the accidental omission of articles containing relevant information. This is to ensure the compilation of a comprehensive and inclusive final selection of texts. Nonetheless, it is important to acknowledge the limitations stemming from our exclusion criteria, such as book chapters, posters, and conference abstracts, which may result in the exclusion of valuable data. In addition, the decision to exclusively include only English-language texts may narrow the review's scope and limit generalisability.

Despite the WHO's effort at eradicating this neglected tropical disease (NTD) from endemic regions like Southeast Asia (SEA), our understanding of LF mosquito vectors in the region remains limited. This review will address the current knowledge gaps by compiling data on vector distribution, ecology, behavior, and transmission capacity. By emphasizing vector species diversity and distribution and pinpointing areas requiring further investigation, we will provide essential insights into LF epidemiology and guide future research efforts.

As the first comprehensive scoping review of LF vector knowledge in the SEA region, this study will yield a vital resource for guiding future research and public health initiatives. The synthesis of distribution, ecological, behavioral, and vector competence data will offer actionable insights, directly supporting the refinement of regional strategies and accelerating progress towards LF eradication.

ACKNOWLEDGMENTS

The authors extend their gratitude to the Director-General of Health, Malaysia, for granting permission to publish this scoping review protocol.

AUTHOR CONTRIBUTIONS

Conceptualization: Mohd Amiru Hariz Aminuddin, Faizul Akmal Abdul Rahim, Mohd Amierul Fikri Mahmud.

Investigation: Mohd Amiru Hariz Aminuddin, Faizal Akmal Abdul Rahim, Khairulaizat Mahdin, Mohd Amierul Fikri Mahmud.

Methodology: Mohd Amiru Hariz Aminuddin, Khairulaizat Mahdin

Project administration: Mohd Amiru Hariz Aminuddin.

Supervision: Mohd Amiru Hariz Aminuddin, Faizul Akmal Abdul Rahim

Writing – original draft: Mohd Amiru Hariz Aminuddin, Mohd Hazrin Hashim

Writing – review and editing : Mohd Amiru Hariz Aminuddin, Mohd Amierul Fikri, Mahmud Faizul Akmal Abdul Rahim, Khairulaizat Mahdin.

ETHICAL CONSIDERATIONS

This scoping review does not require any consent as all analyses will be carried out using secondary data from published articles. All publications will be completed after approval by the Director General of Health of Malaysia.

STUDY OUTPUT

Findings from this study will be disseminated in the form of manuscripts.

REFERENCES

- Davis, E. L., de Vlas, S. J., Fronterre, C., Hollingsworth, T. D., Kontoroupi, P., Michael, E., et al., 2019. The roadmap towards elimination of lymphatic filariasis by 2030: Insights from quantitative and mathematical modelling. *Gates Open Research*, 3. <https://doi.org/10.12688/gatesopenres.12860.2>
- Ottesen, E. A., and Ramachandran, C. P. 1995. Lymphatic filariasis infection and disease: Control strategies. *Parasitology Today*, 11(4), Pp. 129–131.
- Evans, C. C., Pilotte, N., and Moorhead, A. R. 2024. Current status of the diagnosis of *Brugia* spp. infections. *Pathogens*, 13(9), 714. <https://doi.org/10.3390/pathogens13090714>
- McNulty, S. N., Mitreva, M., Weil, G. J., and Fischer, P. U. 2013. Inter- and intra-specific diversity of parasites that cause lymphatic filariasis. *Infection, Genetics and Evolution*, 14(1), Pp. 137–146.
- Famakinde, D. O. 2018. Mosquitoes and the lymphatic filarial parasites: Research trends and budding roadmaps to future disease eradication. *Tropical Medicine and Infectious Disease*, 3(1), 4. <https://doi.org/10.3390/tropicalmed3010004>
- Pedersen, E. M., and Mukoko, D. A. 2002. Impact of insecticide-treated materials on filaria transmission by the various species of vector mosquito in Africa. *Annals of Tropical Medicine and Parasitology*, 96(Suppl. 2), Pp. S91–S95.
- Bockarie, M. J., Pedersen, E. M., White, G. B., and Michael, E. 2009. Role of vector control in the global program to eliminate lymphatic filariasis. *Annual Review of Entomology*, 54, Pp. 469–487.
- Stone, C. M., Lindsay, S. W., and Chitnis, N. 2014. How effective is integrated vector management against malaria and lymphatic filariasis where the diseases are transmitted by the same vector? *PLoS Neglected Tropical Diseases*, 8(12), e3329.
- Paily, K. P., Hoti, S. L., and Das, P. K. 2009. A review of the complexity of biology of lymphatic filarial parasites. *Journal of Parasitic Diseases*, 33(1), Pp. 3–12.
- Nanduri, J., and Kazura, J. W. 1989. Clinical and laboratory aspects of filariasis. *Clinical Microbiology Reviews*, 2, Pp. 39–50.
- Ramaiah, K. D., and Ottesen, E. A. 2014. Progress and impact of 13 years of the Global Programme to Eliminate Lymphatic Filariasis on reducing the burden of filarial disease. *PLoS Neglected Tropical Diseases*, 8(11), e3319. <https://doi.org/10.1371/journal.pntd.0003319>
- Obindo, J., Abdulmalik, J., Nwefoh, E., Agbir, M., Nwoga, C., Armiya'u, A., et al., 2017. Prevalence of depression and associated factors in people living with lymphatic filariasis in Plateau State, Nigeria. *PLoS Neglected Tropical Diseases*, 11(6), e0005569.
- Leang, R., Socheat, D., Bin, B., Bunkea, T., and Odermatt, P. 2004. Assessment of disease and infection of lymphatic filariasis in Northeastern Cambodia. *Tropical Medicine and International Health*, 9(10), Pp. 1115–1120.
- World Health Organization. 2024. Global programme to eliminate lymphatic filariasis: Progress report, 2023.
- World Health Organization Regional Office for South-East Asia. 2013. Towards eliminating lymphatic filariasis: Progress in the South-East Asia Region (2001–2011).
- Ichimori, K., King, J. D., Engels, D., Yajima, A., Mikhailov, A., Lammie, P., et

- al., 2014. Global Programme to Eliminate Lymphatic Filariasis: The processes underlying programme success. *PLoS Neglected Tropical Diseases*, 8(7), e3328.
- Malecela, M. N., and Ducker, C. 2021. A road map for neglected tropical diseases 2021–2030. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 115, Pp. 121–123.
- Irvine, M. A., Stolk, W. A., Smith, M. E., Subramanian, S., Singh, B. K., Weil, G. J., et al., 2017. Effectiveness of a triple-drug regimen for global elimination of lymphatic filariasis: A modelling study. *The Lancet Infectious Diseases*, 17(4), Pp. 451–458.
- Turner, H. C., Bettis, A. A., Chu, B. K., McFarland, D. A., Hooper, P. J., Mante, S. D., et al., 2017. Investment success in public health: Cost-effectiveness of the Global Programme to Eliminate Lymphatic Filariasis. *Clinical Infectious Diseases*, 64(6), Pp. 728–735.
- Utzinger, J., Bergquist, R., Olveda, R., and Zhou, X. N. 2010. Important helminth infections in Southeast Asia: Diversity, potential for control and prospects for elimination. *Advances in Parasitology*, 72, Pp. 1–30.
- Shirley, H., Orriols, A., Hogan, D., Chimfwembe, K., Balya, A., Sibbuku, K., et al., 2023. Lymphatic filariasis in Zambia: A scoping review protocol. *PLoS ONE*, 18(10), e0293440.
- Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., et al., 2018. PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, 169(7), Pp. 467–473.
- McGowan, J., Straus, S., Moher, D., Langlois, E. V., O'Brien, K. K., Horsley, T., et al., 2020. Reporting scoping reviews—PRISMA-ScR extension. *Journal of Clinical Epidemiology*, 123, Pp. 177–179.
- Aromataris, E., and Riitano, D. 2014. Constructing a search strategy and searching for evidence: A guide to the literature search for a systematic review. *American Journal of Nursing*, 114(5), Pp. 49–56. <https://pubmed.ncbi.nlm.nih.gov/24759479/>
- Aromataris, E., and Munn, Z. (Eds.). 2020. *JB I manual for evidence synthesis*. Joanna Briggs Institute.
- World Population Review. 2024. ASEAN countries 2025. <https://worldpopulationreview.com/country-rankings/asean-countries>

