A Scoping Review Protocol of Malaria Vectors in Malaysia

Rafidah Ali (✉ rafidahali1984@gmail.com)

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

Methodology

Keywords: Malaria vector, Anopheles, Malaysia

Posted Date: June 9th, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-581690/v1>

License: This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

Introduction: Malaria is still a public health threat. From 2010 to 2017, a total of 33, 181 malaria cases were recorded in Malaysia. Thus, effective intervention and key entomological information are vital to interrupt or in preventing malaria transmission. Therefore, availability of malaria vectors information is desperately needed. The objective of this study is to established protocols of new and potential malaria vector as a part of existing malaria vectors in Malaysia for human and zoonotic infection.

Methods and analysis: Scoping review will be conducted based on Arksey and O'Malley's methodology on four electronic databases; Scopus, PubMed, Google Scholar and Science Direct. Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Review (PRISMA-ScR) will be used as a systematic approach. All relevant finding will be managed by Mendeley software and Microsoft Excel program.

Ethics and dissemination: Ethical approval is not required on secondary of data. Study findings will be submitted for peer-reviewed publication.

Article Summary (Strengths And Limitations Of This Study)

- This is a novel scoping review of malaria vectors in Malaysia providing a comprehensive evidence summary on updated relevant information.
- With the intention to diversify the range of study context, a broad range of study types will be included.
- Limitations of this study is the exclusion of any unpublished data.

Introduction

Malaria is still a public health threat. It is responsible for 17% of the global burden of parasitic and infectious diseases causing over a million deaths and considerable mortality and morbidity worldwide¹. WHO recorded a total of 219 million malaria cases and 435,000 malaria deaths around the world². On the other hand, Malaysia recorded 33, 181 malaria cases from 2010 until 2017³.

Malaria was caused by four species of *Plasmodium* species i.e. *Plasmodium malariae*, *P. ovale*, *P. vivax* and *P. falciparum*. However, study done by White⁴ and Cox-singh & Singh⁵, confirmed another *Plasmodium* species responsible for zoonotic malaria, *Plasmodium knowlesi* as a fifth species.

Malaria is a vector-borne disease transmitted by Anopheles mosquito⁶. In 2007, WHO recorded 4,500 species of mosquitoes worldwide, in 34 genera from family Culicidae, order Diptera, class Insecta and phylum Arthropoda⁶. It is interestingly noted that only 70 species of Anophelines were confirmed as malaria vectors around the world¹. Malaysia recorded 434 species of mosquitoes⁷. In 1997, Rahman *et al.*, documented that there were 75 species of *Anopheles* recorded in Malaysia⁸. Previous study recorded

there are 9 species of *Anopheles* which were established as a malaria vector in Malaysia, namely *Anopheles balabacensis*, *An maculatus*, *An campestris*, *An sundaicus*, *An letifer*, *An donaldi*, *An dirus*, *An leucosphyrus* and *An flavirostris*⁸. It is interesting to investigate potential malaria vector in keeping with new technology for species complex identification. Potential malaria vector is defined by the vectorial capacity of vector population to transmit malaria⁹.

In accordance to that, Malaysia is working towards eliminating malaria and prevention of re-establishment². Therefore, effective entomological surveillance is most important tools in order to interrupt malaria transmission. This can be achieved by designing a targeted control intervention based on the behavioral of malaria vector. For example, *Anopheles balabacensis* will rest outdoor after feeding¹⁰. Therefore, vector control activities need to be applied and strengthen on wall of the house, tree trunk, bushes or at any possible resting places. Thus, this review will serve as a resource for entomologists, malaria personnel and practitioners to inform malaria vectors in Malaysia. Consequently, entomological information accelerates the process of malaria elimination by enhancing the impact of efficacy of intervention needed². The objectives of this study are to review malaria vectors as well as potential malaria vectors in Malaysia.

Methods And Analysis

Protocol Design

This study will broadly cover subject's area with the nature of research activity on the topic in accordance with 6 stages structured framework (Arksey & O'Malley¹¹ which was refine by Levac et al¹². Six stages of review process were recommended; (1) identifying the research question; (2) identifying relevant studies; (3) selecting studies; (4) charting the data; (5) collating, summarizing and reporting the results and (6) consulting with relevant stakeholder. This scoping review will adhere to 22-Items for Preferred Reporting Items for Systematic Reviews and Meta-Analyses for Scoping Review (PRISMA-ScR)¹³ (Graphic 1).

Stage 1: Identifying the research questions

In order to developed and identify research questions, subject area was examined including the nature of research activity on the relevant topic. Thus, the following research questions were identified:

1. What is the distinguished malaria vector in Malaysia?
2. What is the potential malaria vector in Malaysia?

Stage 2: Identifying relevant studies

Search strategy will be on published scientific journals, grey literature and annual reports using electronic databases such as below:

1. Electronic databases of Pubmed, Scopus, Google Scholar and Science Direct.

2. Relevant research websites such as www.data.gov.my, World Health Organizations (WHO) and Virtual Library Ministry Of Health (MOH).

Articles will be identified using medical subject heading and keywords combination of titles, abstract and keywords (Appendix) using systematic approach to search, screen, review and data extraction. Search will not be restricted by year or language. All selected search results will be imported into Mendeley software and Microsoft Excel spreadsheets (Microsoft Corporation, USA) for references and to manage duplications.

Stage 3: Study selection

All entomological research conducted in Malaysia will be included in this study including the previous reports such as longitudinal study, cross-sectional study, observational study and descriptive report. Firstly, inclusion and exclusion criteria will be used to determine the eligibility of the articles based on the title as the screening part of the review process. Any titles indicated that the research was conducted outside Malaysia will be removed. Secondly, titles and abstracts will be selected based on eligibility criteria. Only abstracts that fulfill the inclusion criteria will be further analyzed. Selected Full articles from of the selected abstracts will be reviewed and included in this study if it is considered significant and relevant studies.

Stage 4: Charting the data

The significant study characteristics from published research literature review will be extracted by a standardized data extraction framework (Table 1). Data extraction framework was developed to guide the extraction and charting process of the data from the articles. It will consist of the standard bibliographical information (title, author, journal, year of publication, language, location of the study and study objectives). Additional information such as type of study, primary outcome and other valuable information section will be included as well. Respectively it will provide an overall significant information about the study and to facilitate data analysis.

Stage 5: Collating, summarizing, and reporting the results

This scoping review intended to present an overview of study area compare to a systematic review where meta-synthesis reporting was required. Thus, information gather will be reported based on selection criteria. The finding of this study will summarize all data and information from the relevant articles and will emphasize the scope of malaria vectors in Malaysia. Furthermore, gaps in research targeting a specific area will be identified and determine. This study will use PRISMA-ScR reporting guidelines to accurately report the review search results.

Stage 6: Consulting with relevant stakeholder

There is a need for entomological information regarding malaria vectors in Malaysia due to insufficient data available. These information are valuable for planning an effective intervention as well as

accelerating the malaria elimination certification. Relevant stakeholders for example, Entomology and Pest Sector, Disease Control Division, Ministry of Health had been consulted and series of discussions will be made as this is an ongoing study. Outcome from the discussions will provide the insights of current entomological situation in malaria risk area as well as malaria situation in Malaysia and ongoing operational research.

Declarations

ETHICS AND DISSEMINATION

Ethical approval is not required as there is no primary data collection. An article detailing the findings of the scoping review will be submitted to a Scientific Journal for publication. Study findings will be disseminated via open-access publications in peer-reviewed journals, presentations to stakeholders, relevant meetings, conferences and Continuous Medical Education at department level as well as part of future seminars and workshops. It will contribute as a dossier of Malaria Elimination Program of Ministry of Health Malaysia.

Acknowledgement

We would like to thank the Director General of Health Malaysia for his permission to publish this article and special thanks to DD Nor Asiah, for constructive comments on the initial draft manuscript.

AUTHOR CONTRIBUTIONS

RA contributed to the study concept, developed the research question, study methods, involved in data extraction, and contributed to the drafting and editing of the manuscript.

Funding

The author has not declared any grant for this research from any funding agency, neither public, commercial nor non-profit sectors.

Competing interests

None declared.

Patient Consent

Not required.

PATIENT AND PUBLIC INVOLVEMENT

No patient involved

Provenance and peer review

Not commissioned; externally peer reviewed.

DATA SHARING STATEMENT

No additional data are available.

Open Access

This is an Open Access article distributed in accordance with the terms of the Creative Commons Attribution (CC BY 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID Ids

Rafidah Ali <http://orcid.org/0000-0001-6714-2853>

Correspondence to: Rafidah Ali; rafidahali1984@gmail.com

References

1. Karunamoorthi K, Sabesan S. 2013. Insecticide Resistance in Insect Vectors of Disease with Special Reference to Mosquitoes: A Potential Threat to Global Public Health. *Health Scope*, 2(1), 4–18. (1) World Health Organization (WHO). 2007. *Anopheline Species Complexes in South and South-East Asia*. India: World Health Organization.
2. World Health Organization (WHO). World malaria report 2018. Geneva: World Health Organization; 2018.
3. Data Mampu Malaysia. 2018. Retrieved on 19 January 2021 from (https://www.data.gov.my/data/en_US/dataset/penyakit-malaria)..
4. White NJ. *Plasmodium knowlesi*: the fifth human malaria parasite. *Clinical Infectious Disease*. 2008;46(2):172–3.
5. Cox-Singh J, Davis TM, Lee KS, Shamsul SS, Matusop A, Ratnam S, Rahman HA, Conway DJ, Singh B. *Plasmodium knowlesi* malaria in humans is widely distributed and potentially life threatening. *Clinical Infectious Disease*. 2008;46(2):165–71.
6. World Health Organization (WHO). *Anopheline Species Complexes in South and South-East Asia*. India: World Health Organization; 2007.
7. Abu Hassan A, Che Salmah MR. A checklist of the mosquito of Malaysia. *Journal of Bioscience*. 1990;1:29–41.
8. Rahman WA, Che'Rus A, Ahmad AH. Malaria and Anopheles mosquitos in Malaysia. *Southeast Asian Journal of Tropical Medicine Public Health*. 1997;28(3):599–605.

9. Institute of Medicine (US) Committee for the Study on Malaria Prevention and Control; Oaks SC Jr, Mitchell VS, Pearson GW et al, editors. Malaria: Obstacles and Opportunities. Washington (DC): National Academies Press (US); 1991. 7, Vector Biology, Ecology, and Control.
10. Tanrang Y, Chooi KH, & Rahman AR. A study of the behaviour of *Anopheles balabacensis*, a malaria vector in Sabah. *Vector Journal*. 1999;5(1):6.
11. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005;8:19–32.
12. Levac D, Colquhoun H, O'Brien KK, et al. Scoping studies: advancing the methodology. *Implement Science*. 2010;5:69.
13. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, Moher D, Peters MD, Horsley T, Weeks L, Hempel S, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med*. 2018;169(7):467–73.

Tables

Table 1
Data extraction framework

Bibliometrics	Characteristics of the review
Title	Objective (s)
Authors	
Source	
Year published	
Language	
Location	
Period of study	
Type of review	Primary: malaria vector Multi: relevant study on malaria infection, plasmodium
Study setting	Type of study setting (research, operational research, systematic review, scientific notes)
Primary vector	Species of vector
Secondary vector	Species of vector
Bionomics of vector	Behavior of the vector
Entomological index	Index derived from the study; Entomological Inoculation Rate (EIR), Sporozoite Rate, Oocyst rate etc.
Primary outcome	Main outcome from the study (distinguished vector, entomological profile and vector characteristic)
Methods	Number of relevant data set and method used
Other	Any other significant findings

Figures

Figure 1

Flow of literature searches and screening process according to the PRISMA-ScR

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Appendixformalariavectorscoping.docx](#)