A Scoping Review Protocol of Malaria Vectors in Malaysia

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Methodology

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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- Limitations of this study is the exclusion of any unpublished data.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 worldwide\(^1\). WHO recorded a total of 219 million malaria cases and 435,000 malaria deaths around the world\(^2\). On the other hand, Malaysia recorded 33,181 malaria cases from 2010 until 2017\(^3\).

Malaria was caused by four species of *Plasmodium* species i.e. *Plasmodium malariae*, *P. ovale*, *P. vivax* and *P. falciparum*. However, study done by White\(^4\) and Cox-singh & Singh\(^5\), confirmed another *Plasmodium* species responsible for zoonotic malaria, *Plasmodium knowlesi* as a fifth species.

Malaria is a vector-borne disease transmitted by Anopheles mosquito\(^6\). In 2007, WHO recorded 4,500 species of mosquitoes worldwide, in 34 genera from family Culicidae, order Diptera, class Insecta and phylum Arthropoda\(^6\). It is interestingly noted that only 70 species of Anophelines were confirmed as malaria vectors around the world\(^1\). Malaysia recorded 434 species of mosquitoes\(^7\). In 1997, Rahman *et al.*, documented that there were 75 species of *Anopheles* recorded in Malaysia\(^8\). 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*. 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 malaria.

In accordance to that, Malaysia is working towards eliminating malaria and prevention of re-establishment. 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 feeding. 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 needed. 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'Malley which was refine by Levac et al.. 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) (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.

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**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.

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**Competing interests**

None declared.

**Patient Consent**

Not required.

**PATIENT AND PUBLIC INVOLVEMENT**

No patient involved

**Provenance and peer review**
DATA SHARING STATEMENT

No additional data are available.

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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.

- Appendixformalariavectorscooping.docx