

REVIEW ARTICLE

Community-Based of Sticky Ovitrap : A Scoping Review

Norsyahida Md Taib^{1,2}, Zulkhairul Naim Sidek Ahmad¹, Abdul Rahman Ramdzan¹, Kamruddin Ahmed^{3,4}, Abdul Marsudi Manah², Mohd Azrool Rizal Mohd Azahari², Arthur Dominic², Syed Sharizman Syed Abdul Rahim^{1,3}

¹ Department of Public Health Medicine, Faculty of Medicine & Health Sciences, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia

² Sabah State Health Department, Ministry of Health Sabah, 88590 Kota Kinabalu, Sabah, Malaysia

³ Borneo Medical and Health Research Centre (BMHRC), Faculty of Medicine & Health Sciences, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia.

⁴ Department of Pathology and Microbiology, Faculty of Medicine & Health Sciences, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia.

ABSTRACT

Community-based sticky ovitraps promote accountability by encouraging responsibility and contribute to efforts to lower dengue cases. This study aims to identify the characteristics, effectiveness, and limitations of the sticky ovitrap through the study of selected articles published between 2013 and 2023. The paper reviewed 204 articles using JBI and PRISMA guidelines. It selected 13 relevant studies and discussed 7 on sticky ovitraps. The reviews indicate that the sticky ovitrap can be constructed with or without an attractant. The effectiveness of sticky ovitrap varies depending on their type, as indicated by differences in ovitrap index, adult catch, and dengue incidence. These traps can be influenced by environmental factors, require regular maintenance, and possess limitations in terms of generalizability. Hence, community involvement is imperative for the sustainable implementation of the sticky ovitrap.

Malaysian Journal of Medicine and Health Sciences (2025) 21(5): 358-364. doi:10.47836/mjmhs.21.5.39

Keywords: Community-based, Sticky ovitrap, Attractant, Effectiveness, Limitation

Corresponding Author:

Norsyahida Md Taib, MPH

Email: kpnsejati112@gmail.com

Tel : +60194756535

INTRODUCTION

Sticky ovitraps are widely used in mosquito surveillance and control programmes worldwide. The traps have demonstrated efficacy in capturing gravid *Aedes* mosquitoes, the primary vectors of dengue, Zika, and chikungunya viruses, making them a promising approach for combating these mosquito-borne diseases (1). Their design typically consists of a container with an adhesive surface that captures mosquitoes in search of a suitable location for egg-laying (2).

The advantages of these traps include their low cost, user-friendly design, and efficacy in control mosquito populations (1). *Aedes aegypti*, a primary vector for dengue, has been studied in different environments, including subterranean habitats and urban areas, to investigate its dispersion patterns and population dynamics. Sticky ovitrap play a significant role in predicting and preventing outbreaks, making valuable contributions to global public health efforts (3).

Furthermore, research has indicated that sticky ovitrap are effective in capturing adult *Aedes aegypti* and *Aedes albopictus* mosquitoes. Certain traps have

shown comparable efficacy to standard ovitrap in detecting the presence of *Aedes aegypti*. For example, a study in Queensland discovered that 67.5% of sticky ovitrap tested positive for *Aedes aegypti*, which closely matching the 64% positivity rate of the standard ovitrap (4). These traps are known for their capacity to assess disease transmission risk and track seasonal mosquito population patterns.

The community participation for example community-based sticky ovitrap will promote ownership, responsibility, and collective action, resulting in ongoing efforts to maintain a dengue-free environment(5). Implementing and evaluating a community-based intervention for strengthening dengue prevention is crucial for identifying effective strategies and determining their impact on reducing dengue cases. Furthermore, there is a scarcity of literature concerning the community sticky ovitrap, particularly in its connection to community involvement and collaborative efforts both between various sectors and within governmental agencies. Thus, this scoping review is to determine the benefits and limitation of using sticky ovitrap on reducing *Aedes* density, enhancing dengue vector surveillance, and improving public health outcomes.

MATERIAL AND METHODS

The proposed scoping review complied with the methodology of the Joanna Briggs Institute (JBI) which is

based on a framework initially proposed by Arksey and O'Malley (6). The JBI structure recommends including six steps in a scoping study to assist the authors. The research process typically involves six main steps: (i) formulating a research question, (ii) finding relevant studies, (iii) study selection, (iv) visualising data, (v) combining, summarising, and reporting results, and (vi) validating study findings (7).

This study utilized the Population, Concept, and Context (PCC) framework to explore whether sticky ovitraps are effective in reducing Aedes mosquito density and the number of dengue cases. The PCC framework was chosen for its ability to enhance the precision and comprehensiveness of the findings. The included studies met the specified criteria.

Formulating the research question

i. Population

This review focused specifically on Aedes mosquito species, particularly those that predominantly breed in ovitraps or black containers, ensuring the population studied was relevant to the research objectives. Studies involving other mosquito species were excluded to maintain this focus.

ii. Concept

This scoping review focused on the characteristic of sticky ovitraps, effectiveness and limitation of the device. Articles on other types of ovitraps were excluded.

iii. Context

The reviewers included publications that had reported the effectiveness of the concept on ovitrap index, larvae survey, number of adult mosquito or number of dengue cases.

Search strategy

The identification of potential and relevant articles is achieved through a scoping review process, which involves comprehensive search strategies in two databases (PubMed and Scopus). The search is limited to articles published between 2013 and 2024. Keywords such as "community", "sticky traps OR sticky Ovitrap OR novel lethal ovitrap" have been utilised in information searches, employing Boolean Operators such as OR and AND. Data was extracted from articles and categorized. Two reviewers independently conducted research based on the PRISMA reporting guidelines for a scoping review, as stated in the article review report (8).

Study selection

The search results are imported into the Mendeley application for note management and annotation, facilitating researchers in locating significant passages in articles. Prior to selection, each article were screened by two independent reviewers for assessment against the inclusion and exclusion criteria for the review. The duplication was removed.

Then, the full text of selected citation was assessed in detail against the inclusion criteria by two independent reviewers. Any feedback and recommendations from the reviewers are considered prior to submitting the final article for further review. The reviewers will communicate with the researcher regarding any issues related to unclear article selection, such as insufficient data or unattainable data sources. Table I showed the article inclusion and exclusion criteria. The list of examined articles only includes studies that provide data on community-based sticky ovitrap.

Table I: Inclusion and exclusion criteria for articles

	Inclusion	Exclusion
Type of study	Quantitative, qualitative and mixed method study design	Report papers
Sticky ovitrap	Studies related sticky ovitrap	Studies not related to the sticky ovitrap
Study finding	<ul style="list-style-type: none"> • The result of the study discuss on type of sticky ovitrap, the effectiveness and limitation of sticky ovitrap • Related to dengue surveillance and prevention 	<ul style="list-style-type: none"> • Study not discuss the effectiveness or limitation of the sticky ovitrap • Not related to dengue surveillance and prevention
Language	English	Different language
Year of publication	2013 to 2023 and 2024 updates	Publication before 2013

Visualizing data

The Microsoft Excel was utilised to import and remove duplicate files from the searched articles. The all article and data files stored in google drive. The studies were independently selected by two reviewers and any discrepancies were resolved through team discussions. The articles underwent two evaluations. The first evaluation involved screening the title and abstract of each article, followed by a full-text screening. The data extraction sheet contained information such as the first author's name, publication year, article title, study design, type of ovitrap, characteristic of sticky ovitrap, effectiveness of sticky ovitrap and limitation of the study. Research results are made in the form of tables and map to facilitate the process of data entry systematically and help identify the data needed in each article.

RESULTS

Identification the potential result

A total of 204 records were retrieved from two electronic databases (Scopus: 122, PubMed: 82). After removing duplicates, 198 titles and abstracts were screened. During the full-text screening stage, only 13 articles that were potentially relevant to the scoping review. Then, articles were excluded based on the reasons outlined in Figure 1. A total 7 articles were included in the final data extraction, quality appraisal, and narrative account stages.

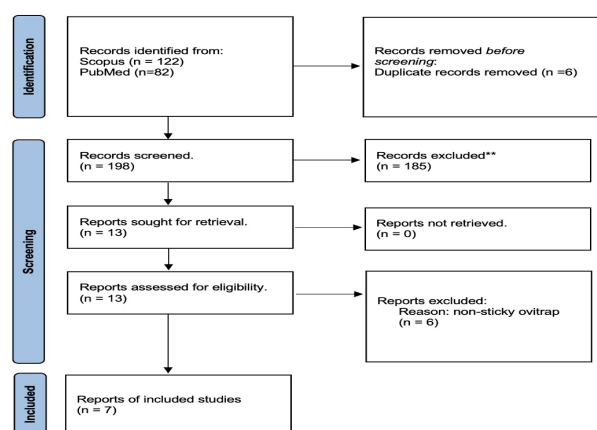


Figure 1: Flow chart of the studies identification and selection process according PRISMA guideline (8)

Characteristic of included articles

The peer-reviewed on the effectiveness of sticky ovitraps has recently declined, as shown in Table II. Of the studies

included, 28% were published between 2019 and 2023, and approximately 72% were published between 2013 and 2018. The studies primarily cover three world regions which are 5 from Asia, 2 from South America, and 1 from Southeast Europe, as shown in Figure 2. All countries are in the sub-tropical and tropical regions.

Type of methods and design

The articles were obtained by two types of study approach. Specifically, six studies utilised quantitative methods, while one study utilised qualitative methods. Among the quantitative studies, there included 2 cluster randomised control trial and 4 quasi-experimental study. The qualitative study conducted by community based participatory approach that employed various measurement methods for data collection, including semi-structured interviews, focus groups discussion and observation questionnaires. The summary of the selected articles as in Table II.

Table II: Summary of articles.

References	Type of sticky ovitraps	Characteristic of sticky ovitraps	Effectiveness	Limitation
(1)	Gravid oviposition sticky (GOS) trap	The 700 ml black container on the outside diameter of 110 mm and a height of 87 mm. While the inside is a round, clear polypropylene plastic cylinder that holds 280 ml. All the traps are filled with 10% hay infusion water.	The number of dengue case and dengue mortality reduced in intervention locality.	<ul style="list-style-type: none"> • Short duration of the study • Less community engagement • External validity
(2)	Attractive Lethal Ovitrap (ALOT)	The inside of black trap lined with green Duranet netting and filled with 500 mL of tap water.	Caught higher for females Aedes mosquito.	<ul style="list-style-type: none"> • Convenience sampling • External validity • Late inclusion of government vector control expert
(10)	Sticky trap	Ovitrap with internal walls or additional structures are coated with adhesive films.	The utility of hay-infusion in increasing egg catches in ovitraps and showed that this attractiveness also significantly increased adult catches in sticky traps.	<ul style="list-style-type: none"> • Sample limitation. • External validity
(4)	MosquiTRAP (adult sticky trap)	Cylinder-shaped, matte black plastic bottle that holds one litre with 300 mL of a 10% Panicum maximum grass infusion base in it and a sticky card is attached to the inside wall of the trap.	MosquiTRAP showed more sensitive, efficient, and timely data collection.	The accuracy of predicting adult population size and transmission risk should be used to validate novel monitoring tools in future studies.
(11)	Sticky trap plus attractant	There are six prototypes with sticky ovitraps that filled with the attractants.	All prototypes able to capture the adult Aedes mosquito.	<ul style="list-style-type: none"> • Phase 3 sampling may not reflect Model F prototype's effectiveness since it was only deployed outdoors and captured Ae. albopictus. Indoor deployment is necessary to assess capture of Aedes Aegypti. • Environmental factor

CONTINUE

Table II: Summary of articles. (CONT.)

Refer- ences	Type of sticky ovitrap	Characteristic of sticky ovitrap	Effectiveness	Limitation
(12)	Double Sticky Ovitrap (DST)	The DST consists of two dark containers set against each other. The upper container is modified by removing its base and lining the inner surface with gummed paper or plastic to attract mosquitoes. The container is connected using fold-back clips.	The Ovitrap Index (OI) is higher by DST followed by NPK Fertiliser Trap, Mosquito Larva Trapping Device (MLTD) and Standard Ovitrap (SO). The number of larvae per ovitrap obtained via DST was considerably higher than MLTD and SO, but not significantly different from NPK Fertiliser Trap.	<ul style="list-style-type: none"> • Environmental factor • Maintenance of the trap • Limited duration of study
(13)	Sticky trap	A black plastic cup (13.5 cm high, 6.5 cm bottom, 9.0 cm top, 13.5 cm high) with a polystyrene cover with four 1.5 cm circular apertures and a grey umbrella to protect trap from rain and dust. Each ovitrap has 60% water (400 ml) and a layer of inexpensive adhesive plastic (24 x 27.5 cm bottom and 7 x 7 cm top).	Can use as predicting dengue outbreak.	Limited time and space

DISCUSSION

The effectiveness of sticky ovitrap

Larvaciding component

The study in Kuala Lumpur, Malaysia regarding the comparing the sticky ovitrap with non-sticky ovitrap and sticky ovitrap with and without attractant showed the highest ovitrap index was achieved by Double Sticky Ovitrap (DST) with 98.9%, followed by NPK Fertiliser Trap (97.7%), Mosquito Larva Trapping Device (MLTD) (97.6%), and Standard Ovitrap (SO) (95.4%). The ANOVA results reveal a significant difference in the mean number of larvae per ovitrap among the four trapping methods ($F(3, 44) = 7.76, p < 0.001$). The mean number of larvae per ovitrap obtained through DST was significantly higher than MLTD and SO, but not significantly different from NPK Fertiliser Trap, as determined by Tukey HSD post-hoc analysis (9).

The Ovitrap Index (OI) for adults, as measured from the NPK Fertiliser Trap, exhibited a significantly higher value ($\chi^2(1, N = 174) = 12.68, p < 0.001$) compared to the DST (9). In other study that used sticky ovitrap with attractant showed that hay-infusion increased egg catches in ovitrap and significantly increased adult catches in sticky traps (10).

Adultciding component

Standard ovitrap are designed primarily for capturing mosquito eggs or larvae by mimicking the breeding sites of mosquitoes. These traps often use water or hay infusion as attractants to lure gravid females to lay their eggs(1,2,9,11). These modifications and advancements in trap design have enabled the capture of adult mosquitoes as well. This type of trap aims at controlling the population by targeting the reproductive cycle of mosquitoes at the adult stage rather than just capturing

larvae or eggs.

The standard ovitrap modified that was modified to the MosquiTRAP in Brazil (2) has an additional advantage as it allows for the measurement of collections in the field during trap service, and the data may be immediately uploaded for analysis using mobile phone networks. On the other hand, ovitrap and larval monitoring approaches necessitate the gathering, subsequent enumeration, and identification of immature stages in a controlled laboratory environment.

The standard ovitrap used in current entomological surveillance typically captures the larval stage (12) but it is not accurate in predicting the adult population. Hence, modification is required for entomological surveillance in endemic dengue areas. For example, study in Malaysia showed all prototypes, except for Models A and D, successfully recaptured *Aedes aegypti* and *Aedes Albopictus*. Model E had the highest mean numbers of recaptured mosquitoes for both *Aedes Aegypti* (3.0 ± 0.26) and *Aedes Albopictus* (2.8 ± 0.25). Model B had similar mean numbers of recaptures for *Aedes Aegypti* (0.9 ± 0.22) and *Aedes Albopictus* (0.9 ± 0.28), followed by Model C (*Aedes Aegypti*: 0.5 ± 0.17 ; *Aedes Albopictus*: 0.4 ± 0.16), Model D, and Model A for *Aedes Aegypti* (0.3 ± 0.15) and *Aedes Albopictus* (0.2 ± 0.20), respectively (11).

Influence the dengue incidence

Sticky ovitrap have been shown to have a significant impact on the monitoring and potentially the control of dengue cases. Studies indicate that sticky ovitrap are more sensitive in detecting the presence of *Aedes* mosquitoes compared to other models, such as standard ovitrap that only collect eggs. The increased sensitivity of sticky ovitrap can detect adult *Aedes* mosquitoes responsible for dengue transmission with more precision,

which allows for a better assessment of the current vector population and, consequently, the immediate risk of dengue transmission.

Study in Malaysia showed by using the sticky ovitrap, the dengue mortality rate reduced in intervention locality compared to non-intervention locality. The case ratio of intervention group (1). By effectively trapping adult mosquitoes, sticky ovitrap reduce the population of potential dengue carriers, which can indirectly lead to a reduction in dengue cases if implemented on a large scale as part of a public health intervention.

The use of sticky plastic in ovitrap greatly improves the trap's sensitivity to detect *Aedes* mosquitoes, making it a more effective tool for monitoring the presence of these vectors over time and potentially predicting dengue outbreaks up to 14 weeks in advance. Sticky plastic alone was more sensitive than other model for detecting indigenous dengue cases with temporal lags of up to 14 weeks. The presence of sticky plastic in ovitrap is significantly affected the amount of *Aedes* eggs ($F = 161.4$; $df = 1, 204$; $P : 0.01$) and house-positive rates ($F = 111.6$; $df = 1, 204$; $P : 0.01$)(13). The data collected from these traps can provide up to a 14-week lead time for predicting potential outbreaks, allowing for timely public health responses to reduce the risk of dengue spread.

Community empowerment

Sticky ovitrap can be a powerful tool for community empowerment in the fight against dengue. They serve as an engaging way for the community to participate actively in dengue surveillance and control. When communities are involved in the monitoring process, they become more aware of the presence of *Aedes* mosquitoes and the risks of dengue fever (5). This can lead to increased community-driven initiatives, such as clean-up campaigns to remove standing water and other potential mosquito breeding sites (2).

Furthermore, the maintenance of sticky ovitrap requires regular replacement of the adhesive surface, which can be seen as labour-intensive. Without active community involvement and understanding of the importance of vector control, the effectiveness of sticky ovitrap in reducing the risk of dengue transmission can be limited (1,9,11).

The limitation of the sticky ovitrap

Short duration of study

Limitation of studies using sticky ovitrap is their limited duration as in study in Brazil (2) and Taiwan (13) for 3 months duration. Short-term studies may not fully capture the variability in mosquito populations caused by seasonal changes, weather events, and changes in human behaviour that affect *Aedes* mosquito breeding and survival rates (14). Furthermore, it is possible that

short-term data may not sufficiently capture the efficacy of interventions or the long-term impact of sticky ovitrap on dengue transmission rates (3). Sticky ovitrap have limited utility in understanding and predicting long-term dengue dynamics if the study period does not cover various environmental conditions and mosquito population fluctuations.

Maintenance the trap

Although sticky ovitrap are effective for monitoring *Aedes* mosquito populations, they have limitations. A primary concern is the practicality of these applications in the field. While sticky ovitrap are highly attractive to *Aedes* mosquitoes, their design may not be practical for widespread use due to factors such as the requirement for regular maintenance, challenges in disposing of trapped mosquitoes, and difficulties in differentiating between species once captured(9). Moreover, the need for frequent replacement of a sticky substance to ensure effectiveness can be both labour intensive and costly, especially when dealing with large areas (1,2,9,11).

Environmental factor

Another limitation is the influence of environmental factors on trap stickiness, potentially diminishing its effectiveness. Adverse weather conditions, such as rain, dust, and wind, can diminish the effectiveness of the sticky surface over time (9,11). In addition, the utilisation of sticky traps may not offer a comprehensive assessment of the mosquito population as *Aedes* mosquitoes exhibit skip oviposition behaviour, wherein they distribute their eggs across multiple locations (13). This behaviour could result in an underestimation of the true population size.

External validity

While sticky ovitrap are useful for capturing adult *Aedes* mosquitoes, their results may not be universally generalizable (1,5). The effectiveness of sticky ovitrap can be influenced by local environmental conditions, cultural practices, and species behaviour (10). Factors such as local climate, the availability of natural breeding sites, and human population density can all affect how representative the data from sticky ovitrap are for a wider area. Therefore, while sticky ovitrap can provide valuable localized data, the findings might not always be applicable to other regions or settings without additional, location-specific research and adjustment.

Recommendation

Sticky ovitrap are recommended in the field of public health for the dengue control and surveillance, requiring community participation, consistent maintenance, and policy support for effective deployment. Future research should focus on design innovations such as eco-friendly materials, Internet of Things (IoT) integration for real-time monitoring, enhanced attractants, and adaptable, user-friendly designs tailored to diverse settings. Policies should prioritize resource allocation, national guidelines, and incentives to sustain community engagement

while positioning ovitraps within an Integrated Vector Management framework.

To maintain the effectiveness of ovitrap, it is important to consistently check and replace the sticky strip. Data collection and analysis can aid in comprehending mosquito population dynamics and the potential for dengue transmission. Further research should be conducted to enhance the design and effectiveness of ovitrap. Comparative studies on trap efficacy can aid in determining the most suitable traps for specific local circumstances.

Another way is seeking support from health authorities and policymakers for the widespread implementation of ovitrap deployment as a component of national dengue control initiatives. Policies bolstering resource provision and logistical support are crucial for the effective deployment of sticky ovitrap.

CONCLUSION

Sticky ovitrap often includes a trapping device baited with attractants (like water or plant infusions) where a sticky surface inside the trap captures adult mosquitoes. Common types include the standard lethal ovitrap and the autocidal gravid ovitrap, which are designed to attract gravid *Aedes* mosquitoes looking for a place to lay their eggs.

The effectiveness of sticky ovitrap is potentially controlling adult mosquito populations, especially *Aedes* species which are known vectors of dengue fever. The use of sticky ovitrap has been associated with accurate and sensitive detection of adult mosquitoes, aiding in dengue surveillance and the prediction of outbreaks.

However, the limitations of sticky ovitrap include issues with practicality and generalizability. They require regular maintenance and replacement, which can be labour-intensive. Community engagement is critical for their success, and without it, the sustainability of sticky ovitrap programs can be compromised. Moreover, the results from a specific area or short-term studies may not be applicable to other settings without additional research, due to the variability in mosquito behaviour and environmental conditions.

ACKNOWLEDGMENT

Special thanks are extended to the academic staff of Public Health Department, Universiti Malaysia Sabah for their invaluable support, guidance, and advice throughout the course of this study. We would also like to express appreciation for all the support from all parties that have contributed directly or indirectly to complete this study.

REFERENCES

1. Liew JWK, Selvarajoo S, Tan W, Ahmad Zaki R, Vythilingam I. Gravid oviposition sticky trap and dengue non-structural 1 antigen test for early surveillance of dengue in multi-storey dwellings: study protocol of a cluster randomized controlled trial. *Infect Dis Poverty* [Internet]. 2019 Sep 3 [cited 2023 Nov 13];8(1). Available from: [/pmc/articles/PMC6720065/](https://pubmed.ncbi.nlm.nih.gov/340249019/) DOI: 10.1186/s40249-019-0584-y
2. de Resende MC, Silva IM, Ellis BR, Eiras BE. A comparison of larval, ovitrap and MosquiTRAP surveillance for *Aedes* (*Stegomyia*) *aegypti*. *Mem Inst Oswaldo Cruz* [Internet]. 2013 Nov 28 [cited 2024 Mar 24];108(8):1024–30. Available from: <https://www.scielo.br/j/mioc/a/WjN8RXFhfwjRbcqrP8DnHJ/?lang=en> DOI: 10.1590/0074-0276130128
3. Sasmita HI, Neoh KB, Yusmalinar S, Anggraeni T, Chang NT, Bong LJ, et al. Ovitrap surveillance of dengue vector mosquitoes in Bandung City, West Java Province, Indonesia. *PLoS Negl Trop Dis* [Internet]. 2021 Oct 1 [cited 2024 Mar 26];15(10). Available from: [/pmc/articles/PMC8577782/](https://pubmed.ncbi.nlm.nih.gov/38577782/) <https://doi.org/10.1371/journal.pntd.0009896>
4. Eiras AE, Resende MC, Acebal JL, Paixro KS, Eiras AE, Resende MC, et al. New Cost-Benefit of Brazilian Technology for Vector Surveillance Using Trapping System. *Malaria* [Internet]. 2018 Nov 5 [cited 2024 Mar 26]; Available from: <https://www.intechopen.com/chapters/63372> DOI:10.5772/intechopen.78781
5. Paz-Soldan VA, Yukich J, Soonthorndhada A, Giron M, Apperson CS, Ponnusamy L, et al. Design and Testing of Novel Lethal Ovitrap to Reduce Populations of *Aedes* Mosquitoes: Community-Based Participatory Research between Industry, Academia and Communities in Peru and Thailand. *PLoS One* [Internet]. 2016 Aug 1 [cited 2023 Nov 4];11(8):e0160386. Available from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0160386> <https://doi.org/10.1371/journal.pone.0160386>
6. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol* [Internet]. 2005 Feb [cited 2024 Mar 24];8(1):19–32. Available from: <https://www.tandfonline.com/doi/abs/10.1080/1364557032000119616>
7. Peters MD, GCM, MP, SCB, KH, & PD. The Joanna Briggs Institute reviewers' manual 2015: methodology for JBI scoping reviews. 2015.
8. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Ann Intern Med* [Internet]. 2018 Oct 2 [cited 2024 Mar 23];169(7):467–73. Available from: <https://www.acpjournals.org/doi/10.7326/>

- M18-0850 DOI: 10.7326/M18-0850
9. Ahmad-Azri M SRAFMAHA. A comparison of different types of ovitraps for outdoor monitoring of *Aedes* mosquitoes in Kuala Lumpur. Trop Biomed [Internet]. 2019 [cited 2024 Mar 24]; Available from: <https://pubmed.ncbi.nlm.nih.gov/33597394/>
 10. Velo E, Kadriaj P, Mersini K, Shukullari A, Manxhari B, Simaku A, et al. Enhancement of *Aedes albopictus* collections by ovitrap and sticky adult trap. Parasit Vectors [Internet]. 2016 Apr 21 [cited 2024 Mar 24];9(1):1–5. Available from: <https://parasitesandvectors.biomedcentral.com/articles/10.1186/s13071-016-1501-x> DOI: 10.1186/s13071-016-1501-x
 11. Roslan MA, Ngui R, Vythilingam I, Sulaiman WYW. Evaluation of sticky traps for adult *Aedes* mosquitoes in Malaysia: a potential monitoring and surveillance tool for the efficacy of control strategies. Journal of Vector Ecology [Internet]. 2017 Dec 1 [cited 2023 Nov 26];42(2):298–307. Available from: <https://onlinelibrary.wiley.com/doi/full/10.1111/jvec.12270>
 12. Nani Mudin R. Dengue Incidence and the Prevention and Control Program in Malaysia. IIUM Medical Journal Malaysia [Internet]. 2015 Jun 1 [cited 2023 Jan 1];14(1):5–9. Available from: <https://journals.iium.edu.my/kom/index.php/imjm/article/view/447> DOI: <https://doi.org/10.31436/imjm.v14i1.447>
 13. Wu HH, Wang CY, Teng HJ, Lin C, Lu LC, Jian SW, et al. A dengue vector surveillance by human population-stratified ovitrap survey for *Aedes* (Diptera: Culicidae) adult and egg collections in high dengue-risk areas of Taiwan. J Med Entomol [Internet]. 2013 Mar [cited 2024 Mar 24];50(2):261–9. Available from: <https://pubmed.ncbi.nlm.nih.gov/23540112/> DOI: 10.1603/me11263
 14. Ayob AM Bin. Dengue Spread Model using Climate Variables. Universiti Teknologi PETRONAS [Internet]. 2016 [cited 2023 Jun 20];83. Available from: <http://utpedia.utp.edu.my/17085/1/FinalDissertation.pdf>