

Communication Matters: A Systematic Literature Review on Malaria Prevention Behaviour Intervention

SIVASANGARI GENAPATHY
EMMA MOHAMAD
HAZWANI DAMANHURI
ARINA ANIS AZLAN*
Universiti Kebangsaan Malaysia

MOHAMMAD REZAL HAMZAH
Universiti Malaysia Perlis

ABSTRACT

Malaria is a significant health problem, particularly in tropical and subtropical regions, regardless of it being a preventable disease. Despite numerous measures taken by health-related agencies, malaria cases continue to increase globally. Most of these interventions are intended to change the behaviours of individuals and communities to reduce the risk of malaria transmission, especially in the long run. However, there is a limited number of systematic reviews in the existing literature that focus on behavioural interventions for malaria prevention. Hence, this systematic review aims to highlight and synthesise studies implementing behavioural interventions to prevent malaria infection among at-risk communities. This study includes English articles from Scopus and Web of Science between the years 2009 to 2022, conducted based on Preferred Reporting Items for Systematic Review and Meta-Analysis 2020 (PRISMA 2020). Out of the initial 67 articles identified through the screening process, four eligible studies of good to medium quality were selected for review. Three main themes were determined based on the deductive thematic analysis: i) tailor-made content, ii) community engagement and outreach, and iii) interpersonal communication. Based on the impact analysis of the four studies, this review concludes that behavioural interventions are an effective strategy to combat the prevalence of malaria worldwide. Hence, communities at risk of malaria would benefit from intervention programs that tap into behavioural change approaches inclusive of the three main themes identified in this review.

Keywords: *Malaria intervention, behavioural intervention, social behavioural intervention, at-risk communities, systematic review.*

INTRODUCTION

Malaria is a life-threatening, vector-borne disease caused by plasmodium parasites that continues to be a significant global health problem (Scott, 2020). According to World Malaria Report 2023, the cases and deaths increased in 2022 compared to 2019, and these concerning trends demand immediate intervention (World Health Organization (WHO), 2023). In 2022, 249 million malaria cases were reported worldwide, and reports showed that 94% of global malaria-related cases are from Sub-Saharan Africa, with 76% of all malaria deaths being children under five, followed by 36% of pregnant women being the most affected group (WHO, 2023). At-risk groups are often poor communities with low knowledge and financial means to seek treatment and take preventive measures (Imai et al., 2014) and displaced populations (WHO, 2023). Despite notable advancements in malaria management and

elimination efforts, it remains a severe threat to global health (Imai et al., 2014; Monroe et al., 2021).

Recent trends in malaria intervention include organizing community workshops to reduce misinformation, paving the way for more aggressive action by health officials, and encouraging community involvement in vector-control initiatives (Cox et al., 2017; Malenga et al., 2017). Interventions should be targeted specifically for the affected area and community with an understanding of their behaviour (Monroe et al., 2021). Non-behaviour interventions proved to be less effective in the long run. According to World Health Organization (WHO) estimates, between 2000 and 2015, there was a 37% global drop in the rate of new malaria cases and a 60% decline in malaria deaths after a massive vector control intervention (World Health Organization, 2017). However, there was no significant decrease in malaria cases or deaths between 2015 and 2017 (World Health Organization, 2018).

Studies suggest that human behaviour change communication must be incorporated into malaria prevention intervention campaigns and programs for positive behaviour change and better sustainability (Naserrudin et al., 2022; Tamari & Bondarev, 2013). This also ensures that communities continue to be engaged, and better health behaviour interventions become an essential strategy to address physical, social, and cultural factors that impact behaviours. According to Koenker et al. (2014), a well-planned behaviour change communication program is beneficial for malaria prevention and treatment, as it enhances public awareness, facilitates early symptom detection, and promotes prompt treatment. Behaviour change communication strategies ought to be considerate of local needs and priorities, as well as the social, political, and economic context of the community (Naserrudin et al., 2022). A study even suggests that health officers be trained on SBCC to ensure structured and well-planned programmes be implemented to build community awareness (Azlan et al., 2023).

Considering the importance of behavioural interventions for malaria prevention, this review aims to highlight and synthesize studies that have implemented prevention behaviour interventions in reducing the prevalence of malaria among at-risk communities. This review underlines the different methods used in the intervention and highlights some vital aspects useful for designing behavioural intervention programs.

MATERIALS AND METHODS

This systematic review was conducted to highlight and synthesize studies that have implemented behavioural interventions to prevent malaria among at-risk communities. Behavioural intervention in this context means a coordinated set of activities designed to change specified behaviour patterns (Michie et al., 2011). These interventions are developed taking into consideration the target populations' culture, social norms, and practices and focusing on modifying behaviours that contribute to the elimination of malaria. The PRISMA 2020 (Nurul Athirah et al., 2022) guidelines were used to identify how this approach was implemented in prior literature. Using the Population/Problem, Interest, Context (PICO) format, the following research question was explored: What are the behavioural interventions (I) for malaria prevention behaviour (Co) among at-risk communities (P)? A search was performed using two electronic databases: Scopus and Web of Science (WoS). Studies suggest that systematic literature reviews must include multiple databases (Zhao, 2014) or a minimum of two or more databases in the review process (Zheng et al., 2008). Web of Science (WoS) and Scopus are the two bibliographic databases generally accepted as the most comprehensive data sources for various purposes (Zhu & Liu, 2020). Hence this systematic review used these two databases to retrieve articles. The keywords were defined

based on the objectives of the study. The protocol for this review was not registered to a systematic review database.

Eligibility Criteria

A set of predetermined criteria for eligibility was utilized to determine whether articles were appropriate for inclusion in the review process. The first criterion was that the article must present primary data that include behavioural intervention for at-risk communities regardless of the type of malaria. Articles including clinical or non-behavioural interventions or on a non-communicable disease other than malaria were excluded. The second criterion was that the article must be an empirical research paper written in English. As stated by Linares-Espinós et al. (2018), selecting a publication language that the researcher understands is crucial to avoid confusion and additional costs for review. Therefore, non-English articles and other document types such as reviews, protocols, guidelines, abstracts, preprints, conference papers, and commentary papers were considered ineligible for the review. The decision to exclude certain documents was made to ensure the articles chosen for this review were of high quality and had sufficient data for analysis (Kamioka, 2019). The third criterion was the year of publication. The review was limited to articles published between 1 January 2009 and 31 December 2022 based on research maturity, considering the concept of research field maturity emphasized by Kraus et al. (2020). Table 1 below presents the inclusion and exclusion criteria of the search through databases.

Table 1: Inclusion and exclusion criteria for the study

Inclusion criteria	Exclusion criteria
Present original (primary) data that included behavioural prevention intervention on any malaria among at-risk communities Empirical research	Articles that include clinical intervention, non-behavioural intervention, or other non-communicable diseases other than malaria Reviews, protocols, guidelines, abstracts, preprints, conference papers, and commentary papers
Published in English between January 2009 and December 2022	Published in a language other than English & not within the years specified

Systematic Review Process

There were several steps involved in the systematic review process. The selection process started with a literature search on Scopus and WoS—databases. The search string was developed based on the objective of this study. “Prevention behaviour intervention”, “malaria”, and “at-risk community” are some of the keywords used in the search string. This ensures that the system identify any articles with these keywords in the title or abstract. Reviewers used the Boolean operators “AND” and “OR” to combine the keywords for the final search strings, and the search term was customized for each database. This brings the selection process to the next step, which is the title and abstract screening. All articles retrieved by the system were exported to a .csv file so that screening could be performed using Microsoft Excel. The details of the search string are shown in Table 2.

Table 2: Keyword search strings

Database	Search string
Web of Science (WoS)	Results for TS=(("Behavioural" OR "behaviour" OR "behavior") AND ("prevention AND behaviour" OR "preventive AND behaviour" OR "prevention AND behavior" OR "preventive AND behavior") AND ("intervention" OR "campaign" OR "program" OR "care" OR "control" OR "management") AND ("malaria" OR "zoonotic" OR "human AND malaria") AND ("high AND risk AND community" OR "high AND risk AND communities" OR "asia" OR "africa" OR "europe" OR "america")) and 2009 or 2010 or 2011 or 2012 or 2013 or 2014 or 2015 or 2016 or 2017 or 2018 or 2019 or 2020 or 2021 or 2022 (Publication Years) and Article (Document Types) and English (Languages)
Scopus	TITLE-ABS-KEY (("Behavioural" OR "behaviour" OR "behavior") AND ("prevention AND behaviour" OR "preventive AND behaviour" OR "prevention AND behavior" OR "preventive AND behavior") AND ("intervention" OR "campaign" OR "program" OR "elimination" OR "preventive" OR "management" OR "care" OR "control") AND ("malaria" OR "zoonotic" OR "human AND malaria") AND ("high AND risk AND community" OR "high AND risk AND communities" OR "asia" OR "africa" OR "europe" OR "america")) AND (LIMIT-TO (DOCTYPE,"ar")) AND (LIMIT-TO (LANGUAGE,"English")) AND (LIMIT-TO (PUBYEAR,2022) OR LIMIT-TO (PUBYEAR,2021) OR LIMIT-TO (PUBYEAR,2020) OR LIMIT-TO (PUBYEAR,2019) OR LIMIT-TO (PUBYEAR,2018) OR LIMIT-TO (PUBYEAR,2017) OR LIMIT-TO (PUBYEAR,2016) OR LIMIT-TO (PUBYEAR,2015) OR LIMIT-TO (PUBYEAR,2014) OR LIMIT-TO (PUBYEAR,2013) OR LIMIT-TO (PUBYEAR,2012))

A total of 231 articles, of which 176 articles from Scopus and 55 articles from WoS databases, were retrieved. 33 articles were removed as redundancies were detected between the two databases. The remaining 198 articles proceeded to the next stage of the screening process. A peer-review method was used to assess the quality of the articles involving four researchers. At this stage, the researchers were required to read the title and abstract of every remaining article to determine if they would proceed to the next stage of the review process. Only articles with a title or abstract that contained identified keywords would be selected for the full-text screening process. Only 67 articles reached the consensus of the reviewers to proceed to a rigorous full-text screening.

A total of 131 articles were removed in this process. To minimize bias among reviewers and to ensure consistent application of the study's parameters, a rigorous review process was employed. Detailed inclusion and exclusion criteria were established, aligned with the study's objectives, and standardized tools were used to guide assessments. Each article was independently reviewed by four reviewers to ensure unbiased evaluations. Discrepancies in assessments were resolved through consensus discussions, and where necessary, the lead researcher served as an adjudicator. This approach ensured that all reviewers adhered to the intended framework and upheld the integrity of the review process.

After completing the full-text screening process, only four articles passed the quality assessment criteria. The Transparent Reporting of Evaluations with Non-Randomized Design (TREND) statement was used to assess the quality of the articles. This statement is specifically used to improve the reporting quality of behavioural and public health interventions (Des Jarlais, 2014). Even though malaria is a mature field, behavioural intervention is still a new approach to malaria prevention or control efforts. Hence, the low number of article selections for review is considerable in specific cases like this (Kraus et al., 2020).

Among the reasons for excluding 63 articles from the synthesis was that articles were about awareness campaigns, medical interventions, the prevalence of malaria, treatment-seeking behaviour, and merely recommended behavioural intervention for future intervention programs. For instance, some studies implemented prevention campaigns for malaria but did not focus on the behaviour change approach. For example, the study by Okedo-Alex et al. (2022) assessed malaria experiences, knowledge, perceived roles in malaria prevention during pregnancy, and the acceptability of community-directed distribution of intermittent preventive therapy (IPTp) for malaria prevention in rural Southeast Nigeria. The study was removed because it did not implement any prevention behaviour intervention. And the study titled *Assessing the Ownership, Usage, and Knowledge of Insecticide-Treated Nets (ITNs) in Malaria Prevention in the Hohoe Municipality, Ghana* by Nyavor et al. (2017) was excluded from this review because it focused on evaluating ITN ownership, usage, knowledge, access, and availability among mothers with children under five in the Hohoe municipality. It did not involve implementing or testing specific behavioural interventions to promote ITN usage or behaviour change but rather provided insights into factors hindering ITN acquisition and usage. It is evident that the behavioural perspective in this field lacks research and has a wide knowledge gap. Hence, this review only involves four articles with a detailed analysis of the outcome. The flow of this systematic review process is explained in Figure 1.

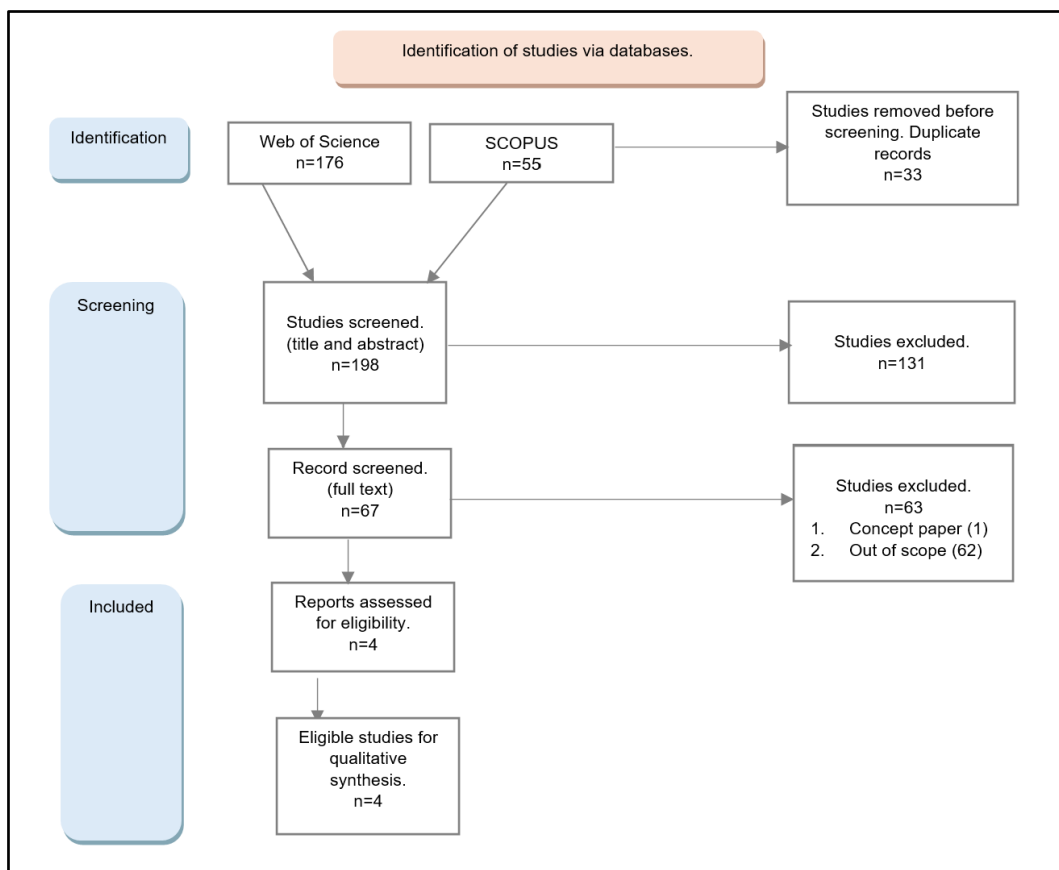


Figure 1: PRISMA 2020 flowchart for the literature screening process

Data Abstraction and Analysis

The four articles that progressed to the qualitative synthesis stage were thematized using the content analysis method. The themes were built by the review's objective, which was to identify malaria prevention behaviour interventions among at-risk communities. Additional themes, such as the strategies, were also extracted and synthesized using the deductive analysis approach.

Data Extraction, Quality Assessment, and Risk of Bias

The data extraction was carried out according to the research question, which means that any data from the reviewed studies that can answer the research question were extracted and presented in a table.

Two reviewers were involved in the data extraction process to reduce the risk of bias and human error. The search results were independently reviewed to identify suitable articles based on clearly defined inclusion and exclusion criteria, which served as the primary parameters to ensure reviewers stayed within the scope of the study. These criteria were established before the review process and were consistently applied throughout. Data extracted from the articles were then validated by two additional reviewers to further ensure accuracy and adherence to the scope. Any differences or discrepancies were resolved through consensus discussions among all four reviewers, guided by the predefined framework.

Data Analysis

Thematic analysis is the process of identifying patterns or themes within qualitative data (Naeem et al., 2023). It is perceived to be the most appropriate method for synthesizing a mixed research design (integrative) (Fleming et al., 2018). Thematic analysis is defined as a descriptive strategy for reducing data in an adaptable way that may be used with other data analysis techniques (Vaismoradi et al., 2013). This study employed inductive thematic analysis to identify patterns and themes emerging from the data (Braun & Clarke, 2006). This approach allowed insights to emerge naturally without imposing pre-existing frameworks or categories.

The four final articles were analysed to identify similar themes between the studies. The themes were built by the review's objective, which was to identify malaria prevention behaviour interventions conducted among at-risk communities. Additional themes, such as the strategies used for the behaviour interventions were also extracted and synthesized. The first step of a thematic analysis is to generate themes. In the process, the authors identified patterns that emerged from the extracted data of all reviewed articles. Any similar or related data were pooled in a group, and eventually, three main groups were created. Subsequently, the authors proceeded to the next stage by naming the themes for each group. Based on thematic analysis, three themes were developed, namely tailor-made content, community engagement and outreach, and interpersonal communication. Out of the four final articles, two studies were conducted in South Africa, and the other two studies were conducted in East and West Africa, respectively. One article was published in 2022, one in 2020, one in 2019, and one in 2015.

RESULTS AND DISCUSSION

Descriptive Analysis

Table 3 below summarizes the included studies.

Table 3: Summary of the included studies

Study	Study Area	Target Group	Actual Group Involved in the Intervention	Strategy	Prevention Behaviour	Monitoring and Evaluation	Impact of the Intervention
Kebede et al. (2020)	Ethiopia	A community based pre-post test study was conducted in five districts of the Jimma Zone. The data were collected in two phases (baseline, 2017) and (end-line, 2019) in five districts of Jimma zone.	Engaged school aged students (5-8 grades) on participatory peer education within small groups, followed by exposing parents with malaria messages aimed to influencing ideation and preventive practices.	School based malaria SBCC. Objective is to evaluate school-based malaria (SBCC) in terms of community message exposure, acceptance, knowledge, and practices. Poems, drama using mini media (facilitators use this media to teach students) Students use cards to influence their parents.	Insecticide treated net	Pre-intervention and post-intervention interviewer assisted questionnaire. The data were collected through face-to-face interviewer administered methods at the household level.	The school-based content intensity of exposure had effects on comprehensive knowledge, message acceptance & ITN utilization.
Anderson et al. (2022)	Vhembe District, Limpopo Province, South Africa.	Grade 3 (usually 10–11 years of age) primary school children	Engaged teachers and parents/guardians/ caretakers as participants to support or focus the young learners	There are 4 groups for pre and post intervention: control, song only, drama only, song and drama. The objective is to increase knowledge about malaria.	Malaria prevention behaviour in general	Pre-intervention and post-intervention interviewer-assisted questionnaire	The song as an intervention was the most effective learning intervention. A song that is easy to remember, repetitive and culturally appropriate will ensure the information is retained and able to be repeated.

							The study concluded that a culturally and age-appropriate song can play a significant role in developing behavioural changes and spreading awareness against disease in a high-risk malaria region.
Russell et al. (2015)	Southeast Nigeria	Household	Enablers: Community health promoters, selected by their community leaders, carried out the intervention at the household and community levels.	A community-based SBC intervention to increase the correct and consistent use of LLINs. SBC intervention activities included: 1) monthly home visits by community health promoters; 2) mobilization of community and religious leaders to support and promote malaria control interventions; and 3) organization of community events including net washing and mending days, workshops to build portable net hanging frames, and malaria-related performances and demonstrations.	Long lasting insecticide net	Pre-intervention and post-intervention interviewer assisted questionnaire.	The odds of net use increased among individuals who were exposed to tailored SBC in the context of a home visit or who received greater degrees of social support from friends and family. Findings suggest that LLIN use is significantly influenced by social support and exposure to a malaria-related SBC home visit.

Eskenazi et al. (2019)	South Africa	Participants were adults residing in 16 villages in the Tulamela region of the Vhembe District Municipal	<p>Use an entertaining skit, songs, and other folk media in the local language.</p> <p>The objective is to increase the attendees' knowledge of precautions to take prior to and after spraying in order to limit their insecticide exposure resulting from IRS.</p>	Insecticide residual spray	The pre- and post-performance questionnaires included questions.	<p>Attendees improved in their knowledge about precautions to take prior to and after spraying.</p> <p>Acceptance of IRS was very high both before and after the skit. However, a brief dramatic presentation and song performed by research study staff, who were not formally trained in the performing arts and wearing simple costumes, was an inexpensive method to increase overall knowledge about ways to prevent undue insecticide.</p> <p>Exposure from IRS in communities such as those in Limpopo, South Africa.</p>
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Research conducted by Russell et al. (2015) examined the determinants that influence net usage and the implications for programmatic interventions aimed at increasing the correct and consistent use of long-lasting insecticide-treated nets (LLINs). The target group for the intervention program is all households in the selected clusters in South-eastern Nigeria. Community health promoters selected by their community leaders carried out the intervention at the household and community levels. The community health promoters acted as enablers in the intervention program. A community-based social behaviour change (SBC) intervention was designed by The Carter Centre and implemented through a partnership with the Ebonyi State Ministry of Health. The intervention involved various activities, including monthly home visits by community health promoters, organising community events such as net washing and mending days, workshops, performances, and demonstrations related to malaria. They also mobilised the community and religious leaders to support and advocate malaria control interventions. Community health promoters assessed specific barriers to net use, hanging, and care during monthly home visits. They used tailored messages and skills-building activities to address those barriers. Illustrated flip charts utilised during these visits to cover the following: i) the malaria transmission cycle, ii) the costs associated with malaria, iii) the importance of sleeping inside a net every night and in every season, iv) strategies for hanging bed nets over any sleeping space, v) the correct height for hanging nets, vi) the importance of mending all holes in bed nets, and vii) the appropriate way to wash a bed net.

The training materials and job aids placed a strong emphasis on fostering social support for net use, based on the belief that social interactions are a major factor in how Nigerians utilise the net. The informational, emotional, and instrumental support that people receive from social network members also contributes to the effectiveness of message retention. The results show that the level of social support for net use received from family and friends and malaria-related home visits are significantly associated with LLIN use in the population. The relationship between net use and social support in this study points to a new direction for messages and activities employed in future SBC interventions. Tailored and interactive strategies such as home visits may be needed to aid households in creating new social norms around net use. The study suggested that some other forms of interpersonal communication may be more effective than mass communication campaigns aimed at raising awareness of malaria or highlighting specific behaviours. In this study, net use was the factor most significantly associated with self-reported exposure to SBC home visits.

The study by Eskenazi et al. (2019) focused on the importance of indoor residual spraying (IRS) for malaria control and strategies to prevent insecticide exposure. A dramatic presentation and song were developed by study personnel and performed by lay performers in the Vhembe District of Limpopo in South Africa. The educational intervention program was conceptualized within the framework of the Health Belief Model. The program consisted of a skit followed by a song in the local language. The skit was developed at the University of California Berkeley (D.I.L.). Then, feedback was elicited from the field office staff of approximately 10 individuals. The updated skit was then performed on patients and staff at the local hospital, as well as on drama students at the University of Pretoria. The skit was then revised based on this feedback. The song was developed by the field office staff based on the information in the skit. The skit and song were performed by Venda Health Examination of Mothers, Babies, and their Environment (VHEMBE) study staff in costume as mosquitos and identified several precautions to be taken before and after spraying.

The presentation was staged in villages that had been sprayed for malaria. Each participant was handed pre- and post-performance questionnaires. Before the drama and song began, the participants were asked to complete the pre-performance questionnaire. After the drama and song were performed, the participants were asked to complete the post-performance questionnaire. Results showed acceptance of the IRS was very high both before and after the skit. However, a brief dramatic presentation and song performed by research study staff, who were not formally trained in the performing arts and wearing simple costumes, was an inexpensive method to increase overall knowledge about ways to prevent undue insecticide exposure from IRS in the communities.

Kebede et al. (2020) used school-based social, and behaviour change communication (SBCC) as part of a malaria intervention in five districts of the Jimma Zone, Ethiopia. This involved engaging students in primary schools in participatory peer education within small groups, followed by exposing parents to malaria messages aimed at influencing ideation and preventive practices. The students were trained by natural science teachers and acted as peer educators, delivering messages about the cause, manifestations, prevention measures, and roles of students in malaria prevention. The intervention also included the formation of anti-malaria clubs and the use of peer education guiding flipcharts. Results showed the intensity of exposure to school-based content had effects on comprehensive knowledge, message acceptance, and insecticide-treated nets (ITNs) utilisation. The study recommends the inclusion of school-based SBCC in the national malaria control programs.

The study by Anderson et al. aimed to compare and assess three teaching intervention strategies to assist young children, specifically grade 3 (typically 10-11 years old) primary school learners about malaria (Anderson et al., 2022). In Phase 1, the interventions included a culturally and age-appropriate song, a drama piece, a combination of song and drama, and a control group that received no intervention. Phase 2 focused on validating the most effective intervention method identified in Phase 1, which was the song. Amongst all the four intervention groups, the group that received only the song showed statistical significance. The interventions were implemented in selected primary schools, and pre-intervention and post-intervention questionnaires were used to assess the knowledge growth of the children. The findings revealed a 'ripple effect' where knowledge conveyed to the children was later passed on to parents and therefore resulted in an increase of knowledge among family members. This is significant as the parents' group for the song scored a statistical significance. The parents mentioned that they heard the song at home and demonstrated knowledge growth based on just hearing the children singing at home.

Thematic Analysis

Table 4 below summarizes the themes identified in the studies.

Table 4: Themes identified in the included studies

Study	Tailor-made content	Community engagement and outreach	Interpersonal communication
Russell et al. (2015)		X	X
Eskenazi et al. (2019)		X	X
Kebede et al. (2020)	X	X	X
Anderson et al. (2022)	X	X	X

The first theme that emerged from this review was tailor-made content, which refers to creative interventions suitable for the culture, norms, and age of the community involved. The studies revealed that the program's content was tailored to each community. Songs, poems, performances, dramatic presentations, and demonstrations were used as mediums to communicate malaria prevention messages. The study by Anderson et al. (2022) emphasised tailor-made content to ensure that the song's message was appropriate for the intended audience. Specialists in social anthropology, music, education, and malaria were involved in the song creation. The song was further tested in elementary schools in a malaria high-risk region to see how well it could teach students about malaria prevention. Similarly, in the study by Kebede et al. (2020), the intervention emphasized the importance of delivering messages that were relevant and applicable to the local context.

The second theme is community engagement and outreach. The studies showed that involving enablers to influence a target group is adequate. Children are commonly treated as a medium to impart malaria knowledge. Besides children, mothers, religious leaders, and community members hand-picked by community leaders were also involved in the intervention as influencers and to disseminate malaria messages. The objective of the message, language, what they need, and what they already know about malaria must be pre-identified to avoid redundancy. Contents must be well-researched and rehearsed. These findings are corroborated by a study conducted in South Africa to increase knowledge about malaria among school children (Anderson et al., 2022) and in another study (Kebede et al., 2020) on the acceptance of malaria messages by primary school children in Ethiopia. Commonly, both studies employed school-based interventions and used songs in local languages to create awareness of malaria, its symptoms, and prevention behaviours. Both studies reported the usage of songs as an effective communication tool to increase knowledge and promote behavioural change messages. They utilized existing community networks and gatherings to effectively engage the community and promote behaviour change toward malaria prevention and control. Similarly, the study by Eskenazi et al. (2019) utilized dramatic presentations and songs to engage the community, raise awareness about the importance of indoor residual spraying (IRS), and minimise insecticide exposure.

The third theme is interpersonal communication. All studies in this review utilized this approach in their intervention programs. The results of the studies proved that this form of communication is more effective than mass communication media when communicating malaria messages among at-risk communities. This approach includes home visits, social support, and program monitoring. For example, a study involving pre and post-intervention interviews with Grade 3 learners and their teachers to assess their knowledge of malaria and the impact of the interventions (Anderson et al., 2022). The teachers were also asked about their observations during the intervention period. Additionally, some parents/caregivers/guardians of the children were interviewed to determine if the children shared their knowledge with them. This interpersonal communication allowed for the exchange of information and insights between the researchers, teachers, learners, and parents, contributing to the evaluation of the intervention's effectiveness and the understanding of knowledge transfer within the community.

This was also similar to a study that utilised facilitators, including natural science teachers and student army leaders, to conduct peer-to-peer education sessions to disseminate malaria messages and promote preventive practices to effectively convey information, address concerns, and foster behaviour change within the community (Kebede et al., 2020). Studies also utilised interpersonal communication to gather participants. For

example, research staff personally invited women who had participated in the VHEMBE birth cohort study and they were encouraged to invite friends, family, and other residents of their villages (Eskenazi et al., 2019). This strategy promotes trust which results in better message transmission and behaviour change. Similarly, a different study demonstrated community engagement and interpersonal communication (Russell et al., 2015) and further stressed that, to increase net use compliance, future malaria programs should consider shifting from the typical mass communication campaign model to community-based interventions involving household visits that incorporate strategies for enhancing community outreach and social support for net use among participants.

It is apparent that going beyond mass communication campaigns and focusing on tailor-made content, interpersonal communication, and community engagement are the underlying strategies used in the reviewed studies. Many other studies have used these strategies in their interventions. In a population-based study of smoking cessation among low-income populations, the result shows that harnessing interpersonal communication in the intervention program was effective and promoted sustainability (Makos & Thompson, 2023). Besides that, in a mental health literacy program study among school children, it was identified that the effects of the intervention are often inconsistent and unsustainable. The study results suggested that mental health literacy intervention programs must be grounded in interpersonal communication for it to be effective (Makos & Thompson, 2023).

Targeted interpersonal communication interventions with community members may be highly effective at increasing the behaviour of care-seeking for a child's fever (Hutchinson et al., 2023). A study on preventing unsafe abortion among communities in Nepal used interpersonal communication in the form of dialogue and exchange of information between individuals, seeking to clarify beliefs and understanding. It emphasizes the importance of interpersonal context, including family relationships and social support networks, as entry points for social change. Besides increased knowledge of unsafe abortion, the study reported that the intervention led to an increase in modern family planning use and participants acting as change agents in their communities, disseminating accurate information and behaviour change stories (Makos & Thompson, 2023).

On the other hand, community engagement and outreach also have advantages when it comes to effective message dissemination and promoting sustainable behaviour change. Studies suggest that the involvement of community healthcare workers in HIV care reduces stigma among community members (Nachega et al., 2016) and being part of peer groups has been found to decrease the perception of social stigma (Wouters et al., 2012). Also, in a study on COVID-19 immunization campaign, the result shows that community engagement enables the health sector to efficiently provide customized immunization services to the target population's norms and practices (Putra & Safitri, 2024).

Additionally, tailor-made content can deliver messages at the population level while being targeted at the individual level. This method increases the effectiveness of behaviour change and enhances message relevance because it is customized to individual or community characteristics (Noar et al., 2009), and is particularly effective in behaviour change in health communication (Bol et al., 2020). In a Hispanic study, an experiment was conducted to assess the effectiveness of generic and targeted messages on basic information on kidney functions. The generic message attempted to convince the participants that they were at high risk for kidney disease. The targeted message was identical to the generic message but was specifically created for Hispanics in terms of language and images.

The results indicated that the tailored message outperformed the generic message and showed the highest efficacy (Noar et al., 2009). In a systematic review and meta-analysis of tailored text messaging interventions for type II diabetes self-management, researchers found that these tailored interventions substantially contributed to effective glycemic control (Sahin et al., 2019). Panter-Brick et al. (2006) suggested that intervention initiatives should be designed, implemented, and evaluated from a social ecology perspective. This approach considers the behavioural context such as habits and norms so that the desired change can be effortlessly integrated into the social, cultural, and ecological landscapes of the community. The same study found that using music to encourage the repair and maintenance of mosquito bed nets for malaria control in rural Gambia was successful.

Another common strategy was that all four studies were embedded in the Social Behavioural Change Communication (SBCC) approach and aimed at behaviour change ultimately. The use of culturally and age-appropriate songs to disseminate malaria knowledge, implementation of dramatic presentation and song which was carefully curated to suit the culture and norms of the community, involving community members as performers to disseminate the messages, having malaria-related performances and demonstrations are some of the clever ways to implement the SBCC strategies. Besides that, two of the studies used children as the change agents to reach out to their families and communities with malaria prevention messages. Children have served as an effective change agent in many other health-related studies (Jia, 2017) which makes it an effective SBCC strategy in the context of these studies. Furthermore, the involvement of community leaders, religious leaders, and teachers to support and promote malaria control messages is also evident in the studies.

Three out of four studies demonstrated monitoring and evaluation which is an integral part of the SBCC approach to evaluate the success of the intervention. Commonly pre-and post-intervention surveys were conducted. The other study assesses the success of the program by analysing the association between net use and various factors and identifying the factors that influenced net use behaviour. Behavioural intervention with appropriate planning following SBCC would be an effective strategy for malaria prevention among at-risk communities. Campaign planners and policymakers should consider this strategy when planning malaria prevention campaigns for at-risk communities.

CONCLUSION

This systematic review underscores the pivotal role of behavioural interventions in malaria prevention among at-risk communities. The analysis identified three key themes: tailor-made content, community engagement and outreach, and interpersonal communication as essential components of successful interventions. However, the limited number of eligible studies in this review highlights a substantial gap in research, underscoring the need for more comprehensive investigations into behavioural approaches for malaria prevention.

While this systematic review offers valuable insights into the role of behavioural interventions in malaria prevention, several areas could be further explored to strengthen the evidence base. Future research should include a larger number of studies from diverse geographical regions to enhance the generalizability of the findings. Expanding the scope to include different behavioural interventions, such as those involving digital platforms or mobile health technologies, could also provide insights into innovative strategies that reach broader audiences.

For stakeholders, including policymakers, health organizations, and local communities, this review underscores the importance of integrating behavioural change approaches into malaria prevention programs. The findings of this review can guide the design and implementation of targeted interventions that are more likely to resonate with at-risk populations, ultimately contributing to a more sustainable reduction in malaria transmission.

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BIODATA

Sivasangari Genapathy is a doctorate student at the Centre for Research in Media and Communication, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia. She is a graduate research assistant for this research grant. Her area of interest is in health communication. Email: P97277@siswa.ukm.edu.my

Emma Mohamad (PhD) is a senior lecturer at the Centre for Research in Media and Communication, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia. She is currently serving as a Deputy Dean (Research and Innovation) at the faculty. Her area of expertise is in health communication. Email: emmamohamad@ukm.edu.my

Hazwani Damanhuri is a Doctorate student at the Centre for Research in Media and Communication, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia. She is a graduate research assistant for this research grant. Her area of interest is in health communication. Email: hazwanidamanhuri@gmail.com

Arina Anis Azlan (PhD) (corresponding author) is a senior lecturer at the Centre for Research in Media and Communication, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia. She is also the Head of Postgraduate Programme at the centre. Her area of expertise is in health communication and information management. Email: arina@ukm.edu.my

Mohammad Rezal Hamzah (PhD) is a Dean of the Faculty of Business and Communication, at Universiti Malaysia Perlis. His area of expertise is new media communication and health communication. Email: rezal@unimap.edu.my

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