

Antibiotic awareness campaign evaluation: A systematic review of strategy, multisectoral engagement, and community-level implementation

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ARTICLE INFO

Article history:

Received Jul 9, 2025
Revised Jul 13, 2025
Accepted Jul 20, 2025

Keywords:

Antibiotics
Implementation at the
Community Level
Multi-Sector Engagement

ABSTRACT

Inappropriate antibiotic use contributes to increasing antimicrobial resistance, a global health challenge. Public awareness campaigns are considered a crucial strategy for promoting rational antibiotic use. This article aims to systematically review published studies on antibiotic awareness campaigns globally, focusing on implementation strategies, multisectoral actor involvement, and community-level implementation. This review employed a systematic review of literature obtained from Scopus, PubMed, and ScienceDirect databases. The inclusion criteria were empirical studies (quantitative, qualitative, or mixed) published between 2019 and 2024 that addressed public antibiotic education campaigns. Based on the 294 identified articles, 12 selected studies were further analyzed. The results demonstrate a variety of campaign media, the predominance of short-term intervention durations, and the importance of multisectoral engagement. Studies that included pre-post evaluations of Knowledge, Attitude, and Practice were more effective in demonstrating the impact of behavioral change. Conclusions: Campaigns that are contextual, involve the community, and are supported by intersectoral collaboration have been shown to be more effective. This review recommends the need for sustainable campaigns and strategies tailored to local community characteristics, particularly in rural areas and vulnerable groups.

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INTRODUCTION

Inappropriate use of antibiotics has become a global health problem that contributes significantly to the increase in antibiotic resistance. (Pangandaheng, Losoiyo, & Repiltaman, 2025), (Simorangkir, nd) According to the WHO (2020) report, antimicrobial resistance has become a major threat to public health worldwide, with prevalence continuing to increase in various countries, including Indonesia. Based on the 2023 Indonesian Health Survey (SKI), the proportion of antibiotic use in the community for certain diseases such as diarrhea, fever, skin infections, sore throats, coughs, colds, and even aches and pains is quite high. Many factors influence the inappropriate and

incorrect use of antibiotics, such as a lack of knowledge, which affects public behavior and awareness.(Tjipta, 2020),(Vatrisya, Febliyanti, & Anggraini, 2024). The level of knowledge of antibiotic use among Indonesians from the 2023 SKI, it was found that the lowest proportion of knowledge was "if used inappropriately, germs become resistant" (26.8%) and "antibiotics for bacterial infections" (28.7%).(Burhan, 2024),(Anggraeni et al., 2023).

A review of community campaigns by Roope, et al (2020) aimed at increasing antibiotic use among outpatients in high-income countries concluded that some campaigns had a positive impact (Sulaiman, 2022),(Pawlowski, n.d.)However, almost all are multifaceted, simultaneously targeting clinicians and the public with multiple interventions. Research on the effectiveness of fear-based messages in other healthcare settings suggests that fear-based messages about antibiotics and AMR are likely to be more effective in reducing antibiotic consultations and requests, particularly among those with low AMR awareness, if they include empowering information about effective self-management without antibiotics (Yusuf, 2021),(Ersila & ST, 2024).

The study found that 59.75% of respondents consumed beta-lactam antibiotics (amoxicillin 51.22%). One-third (35.71%) of respondents confirmed actions that could lead to inappropriate antibiotic use and potentially contribute to antibiotic resistance (Widayati, 2020),(KIA & AMIRULLOH, nd)There is a misunderstanding about which conditions can and cannot be treated with antibiotics. Most identify a range of actions that can be taken to address the problem of antibiotic resistance. There is a misunderstanding about what antibiotic resistance means (Musdja, nd),(Mulasari et al., nd). The aim of this study was to systematically review all published studies in several countries and to provide relevant recommendations regarding methods for behavioral change campaigns regarding drug use in the community (Fatoni, nd),(Mandowa, 2022).

RESEARCH METHOD

The journal search strategy was searched through Scopus, Science direct, and PubMed databases for all published studies using the keywords "Campaign, education, awareness, behavior of the community and antibiotics". Data sources were obtained online, then selected based on inclusion and exclusion criteria. A systematic search was conducted with the combination terms of "Campaign And Education And Awareness And Behavior And Public And Community And Antibiotic".

Inclusion and Exclusion Criteria

English-language campaign evaluation studies from various countries were included in this review, provided they were available in full-text and freely accessible. Articles available only in abstract form were excluded. The authors selected studies that reported both quantitative and qualitative data related to campaign design, evaluation methods, and reported outcomes. This review included only studies in human populations and publications published within the last five years, between 2019 and 2024. Studies that did not meet the criteria, including animal studies, laboratory studies, editorials, and other non-empirical articles, were excluded.

To help identify the focus of the study, researchers used the PICO (Population, Intervention, Comparison, Outcome) framework. This approach is commonly used in systematic review studies to structure research questions and guide the selection and analysis of articles. The PICO structure is presented in Table 1.

Table 1. PICO structure formulation

| Component | Study identification |
|------------------|--|
| P (Population) | General public |
| I (Intervention) | Educational campaigns or interventions |
| C (Comparison) | Evaluation |
| O (Outcome) | Changes in KAP (knowledge, attitude, behavior) |

The information needed to obtain an antibiotic campaign evaluation from articles was obtained using the Prisma checklist guide. The criteria required for each article include those listed in Table 2.

Table 2. Selection criteria for evaluation of the behavioral awareness campaign for use antibiotics in society

| | |
|---|---|
| Research design | settings and locations |
| | Type of study |
| | Study perspective |
| | Time coverage |
| Information about the antibiotic campaign | General description of the antibiotic campaign |
| | Awareness or change in behavior |
| | Studies on antibiotic use |
| Evaluation components | Evaluation methods |
| | Impact measurement indicators (IME) |
| | Types of intervention |
| Campaign Results | IEC (Communication, Information and Education) Method |
| | Behavioral changes |
| | Increased awareness |

RESULTS AND DISCUSSIONS

Results

Identification of literature from the original article search was obtained according to the inclusion criteria from Scopus data 1 article, PubMed 8 articles and Science Direct 3 articles, after excluding studies that were not relevant to the inclusion and exclusion criteria.

Table 3. Distribution of respondent characteristics

| Campaign and education and awareness and behavior and public and community and antibiotics | Scopus | Pubmed | Science direct |
|--|--------|--------|----------------|
| Screening | | | |
| Clear screening | 14 | 23 | 2257 |
| 5 years, open access | 4 | 9 | 28 |
| Full text | 2 | 8 | 6(1 review) |
| Duplication | | 1 | |

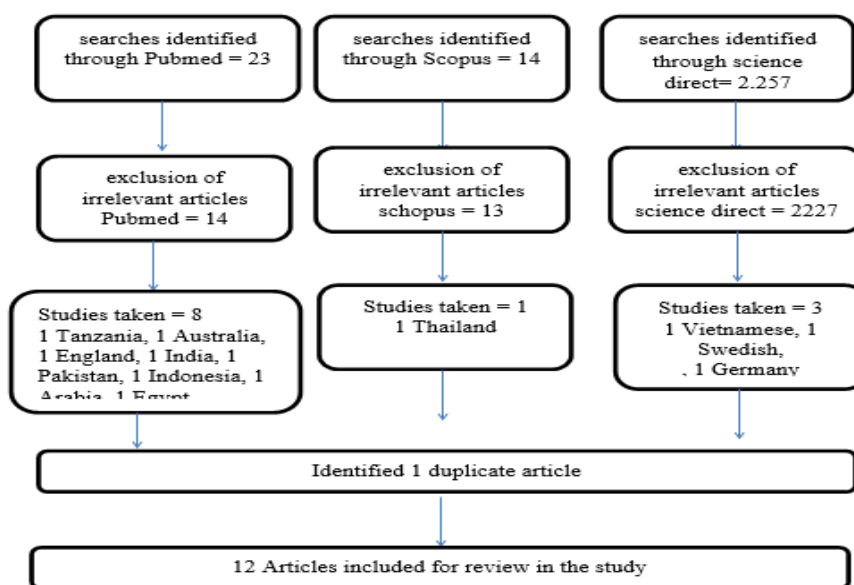


Figure 1. Literature search from three databases

Table 4. Summary of 12 selected articles on evaluation of antibiotic awareness campaigns

| Title & Author | Country of Study | Data Types | Type of Intervention | Study Quality | Narrative Summary |
|---|-----------------------|-------------------------|---------------------------|---------------|--|
| Charoenboon et al., 2019 Translating antimicrobial resistance: a case study of context and consequences of antibiotic-related communication in three northern Thai villages | Thailand | Qualitative | Community communication | Good | Community-based studies demonstrate local perceptions of resistance and the importance of contextual communication. |
| Nguyen et al., 2024, Dilemmas of care: Healthcare seeking behaviors and antibiotic use among women in rural communities in Nam Dinh Province, Vietnam | Vietnam | Qualitative | Community experience | Good | Describes cultural and social dilemmas in the search for treatment and use of antibiotics by rural women. |
| Carelli, 2024, From ignorance to awareness: Quality of collaborative governance enhances public awareness of AMR | Global | Qualitative | Collaborative governance | Good | Demonstrates how institutional collaboration raises awareness of AMR. |
| Dixon et al., 2022, Antibiotics, rational drug use and the architecture of global health in Zimbabwe | Zimbabwe | Descriptive | Health system structure | Enough | Structural analysis of health systems in antibiotic use practices. |
| Ndaki et al., 2023, Practices and motives behind antibiotics provision in drug outlets in Tanzania: A qualitative study | Tanzania | Qualitative | Pharmacy outlet interview | Good | Revealing the motivations for providing antibiotics without a prescription from a social and economic perspective. |
| Hawkins et al., 2021, Comparing public attitudes, knowledge, beliefs and behaviors towards antibiotics and antimicrobial resistance in Australia, United Kingdom, and Sweden (2010-2021): A systematic review, meta-analysis, and comparative policy analysis | Australia, UK, Sweden | Quantitative + Meta | Survey & public policy | Very good | Meta-analysis of cross-country trends in public attitudes and antibiotic policies. |
| Seaton et al., 2022, Evaluating UK Pharmacy Workers' Knowledge, Attitudes and Behavior towards Antimicrobial Stewardship and Assessing the Impact of Training in Community Pharmacy | UK | Quantitative (pre-post) | AMS Training | Good | Evaluation of AMS training for community pharmacists with a real impact on practice. |
| Kotwano et al., 2021, Knowledge and behavior of consumers towards the non-prescription purchase of antibiotics: An insight from a qualitative study from New Delhi, India | India | Qualitative | Consumer interviews | Good | Exploring the motives and practices of purchasing antibiotics without a prescription. |
| Ferdiana et al., 2024, The impact of a multi-faceted intervention on non-prescription dispensing of antibiotics by urban community pharmacies in | Indonesia | Mixed-method | Multifaceted intervention | Very good | A multifaceted educational campaign successfully reduced the practice of non-prescription antibiotic administration. |

| Title & Author | Country of Study | Data Types | Type of Intervention | Study Quality | Narrative Summary |
|---|-------------------|--------------------------------|----------------------|---------------|---|
| Indonesia: a mixed methods evaluation Hafez et al., 2024, Pharmacies and use of antibiotics: a cross-sectional study in 19 Arab countries | 19 Arab countries | Quantitative (cross-sectional) | Community survey | Enough | The patterns reflect common practices and perceptions about non-prescription antibiotics. |
| Maarouf et al., 2023, Knowledge, attitudes and behavior of Egyptians towards antibiotic use in the community: can we do better? | Egypt | Quantitative (KAP survey) | Community survey | Good | The gap between public attitudes and practices towards antibiotics. |
| Khan et al., 2024, Knowledge, Attitude, and Practice on Antibiotics and Their Resistance: A Two-Phase Mixed-Methods Online Study among Pakistani Community Pharmacists to Promote Rational Antibiotic Use | Pakistan | Mixed-method | Online survey | Good | Demonstrates pharmacists' practices and knowledge gaps regarding antibiotic use and resistance. |

The results of this systematic review indicate that various forms of educational campaigns and interventions aimed at the general public can significantly contribute to increasing awareness and changing behaviors toward more rational antibiotic use. Of the twelve studies analyzed, most demonstrated good methodological quality, with diverse and contextualized data approaches tailored to the sociocultural context of each country.

A review of various studies shows that the effectiveness of antibiotic awareness campaigns is strongly influenced by the local social and cultural context. Studies from Southeast Asia, such as Thailand, Vietnam, and Indonesia, highlight the importance of participatory, community-based approaches to reach communities with diverse norms and access to healthcare. The types of interventions used vary, from interpersonal communication and health worker training to multifaceted, regulatory-based strategies. Robust evaluations, particularly those using mixed-methods approaches, have been shown to provide a more comprehensive picture of behavior change and the contextual factors that influence it. However, challenges such as the purchase of antibiotics without a prescription remain widespread across countries, reflecting the need for more integrated and sustainable interventions. These findings indicate that campaign success depends not only on message content but also on the delivery medium, cross-sector engagement, and consistent policy support.

The variety of social and cultural contexts of studies from Asian regions, such as Thailand(Charoenboon, Haenssgen, Warapikuptanun, Xayavong, & Khine Zaw, 2019), emphasizes the importance of understanding local social and cultural dynamics in designing educational campaigns. Community knowledge about antibiotic resistance is often shaped by health experiences, local norms, and access to health services. Participatory, community-based interventions have proven more effective in changing community perceptions and practices.

The types of effective interventions used in the selected studies included a variety of strategies, ranging from community-based interpersonal communication, training of health workers(Seaton, Ashiru-Oredope, Charlesworth, Gemmell, & Harrison, 2022), to multifaceted campaigns based on policy and regulations(Ferdiana et al., 2024)Studies from Pakistan and Egypt also show that online survey approaches and KAP surveys can be useful tools for monitoring the effectiveness of policy-based interventions.

Most studies included a robust evaluation component, both qualitative and quantitative. Mixed-methods studies (e.g., Ferdiana et al., 2024; Khan et al., 2024) provided a deeper understanding of behavioral and perceptual changes and identified contextual factors influencing

intervention outcomes. This demonstrates the importance of integrating survey data with qualitative insights to evaluate program success.

Global and regional challenges: A cross-country analysis by Hawkins et al. (2021) shows that despite increasing awareness of antimicrobial resistance, significant differences in public behavior regarding antibiotic use persist, both between countries and within regions. The practice of purchasing antibiotics without a prescription, as found in India (Kotwano et al., 2021) and Arab countries (Hafez et al., 2024), remains a major challenge in resistance control efforts.

This review underscores that the effectiveness of antibiotic campaigns is determined not only by the content of the educational message, but also by the delivery medium, public participation, and integration with supportive policies. The most successful studies, such as those by Ferdiana et al. (2024) and Hawkins et al. (2021), combined an educational approach with a monitoring system and cross-sectoral engagement across education, health, and public policy.

Table 5. Summary of 12 selected articles based on approach, media, and duration of intervention

| Author & Year | Target Group | Campaign Media | Duration of Intervention | Multi-sector Engagement |
|--------------------------|----------------------------------|--------------------------------------|--|--|
| Charoenboon et al., 2019 | Minority village community | Community dialogue, local narratives | Takes place in stages | Local institutions, academics |
| Nguyen et al., 2024 | Village women | Social & experience interviews | Not mentioned (social longitudinal) | Local researchers and health workers |
| Carelli, 2024 | General public across countries | Public policy & discussion platform | Policy-based (long-term) | Government, civil society |
| Dixon et al., 2022 | Patients & health systems | Structural & regulatory analysis | Passive analysis (without direct intervention) | National health system |
| Ndaki et al., 2023 | Pharmacy outlet officer | Field interviews | Not explained (single interview) | Healthcare workers & regulators |
| Hawkins et al., 2021 | General public | Online surveys & mass media | Multi-year (2010-2021) | Policy makers and academics |
| Seaton et al., 2022 | Community pharmacist | Structured training | Short training (pre-post) | Community pharmacy & trainer |
| Kotwano et al., 2021 | Urban consumers | Interview & observation | Short (1 interview time) | Limited to consumers |
| Ferdiana et al., 2024 | Urban society + pharmacy | Print media, training, community | Several months | Academics, government, pharmacists |
| Hafez et al., 2024 | Communities in 19 Arab countries | Cross-country survey | Not mentioned | Researchers & national health agencies |
| Maarouf et al., 2023 | Egyptian general public | Direct KAP survey | Short (single KAP survey) | Researchers & local authorities |
| Khan et al., 2024 | Online community pharmacist | Online surveys and interviews | Short (2-stage online survey) | Community & academic pharmacists |

Table 6. Summary of 12 selected articles based on approach, media, and duration of intervention

| Author & Year | Target Group | Campaign Media | Duration of Intervention | Multi-sector Engagement |
|--------------------------|---------------------------------|--------------------------------------|--|--------------------------------------|
| Charoenboon et al., 2019 | Minority village community | Community dialogue, local narratives | Takes place in stages | Local institutions, academics |
| Nguyen et al., 2024 | Village women | Social & experience interviews | Not mentioned (social longitudinal) | Local researchers and health workers |
| Carelli, 2024 | General public across countries | Public policy & discussion platform | Policy-based (long-term) | Government, civil society |
| Dixon et al., 2022 | Patients & health systems | Structural & regulatory analysis | Passive analysis (without direct intervention) | National health system |
| Ndaki et al., 2023 | Pharmacy outlet officer | Field interviews | Not explained (single interview) | Healthcare workers & regulators |
| Hawkins et al., 2021 | General public | Online surveys & mass media | Multi-year (2010-2021) | Policy makers and academics |
| Seaton et al., | Community pharmacist | Structured training | Short training (pre- | Community pharmacy |

| Author & Year | Target Group | Campaign Media | Duration of Intervention | Multi-sector Engagement |
|---------------------------------|----------------------------------|----------------------------------|-------------------------------|--|
| 2022 Kotwano et al., 2021 | Urban consumers | Interview & observation | Short (1 interview post) | Limited to consumers |
| Ferdiana et al., 2024 | Urban society + pharmacy | Print media, training, community | Several months | Academics, government, pharmacists |
| Hafez et al., 2024 | Communities in 19 Arab countries | Cross-country survey | Not mentioned | Researchers & national health agencies |
| Maarouf et al., 2023 | Egyptian general public | Direct KAP survey | Short (single KAP survey) | Researchers & local authorities |
| Khan et al., 2024 | Online community pharmacist | Online surveys and interviews | Short (2-stage online survey) | Community & academic pharmacists |

The analysis of twelve studies shows that antibiotic awareness campaigns aimed at the general public, particularly rural communities and minority groups, vary in their approaches, media, and duration. Several studies targeting local communities, such as Charoenboon et al. (2019) and Nguyen et al. (2024), emphasize the importance of culturally based approaches and local narratives, which have been shown to build emotional engagement and contextual understanding of antibiotic resistance. Meanwhile, formal training-based campaigns (Setiawan et al., 2010) and multifaceted interventions (Ferdiana et al., 2024) showed good effectiveness in urban areas and health care facilities.

The duration of interventions was mostly short-term or not described in detail, although some studies (such as) showed the impact of campaigns that lasted over the long term. Multisectoral engagement was found to be a key element of success, especially when involving academics, government, local communities, and health workers. (Fatoni, nd) Studies showing cross-sector collaboration tend to better integrate campaigns into local community systems and norms than campaigns conducted separately without institutional support. These findings provide important insights for designing contextual, sustainable, and collaborative campaign interventions in rural areas with vulnerable populations.

To deepen our understanding of the characteristics and approaches of antibiotic campaigns reported in various studies, a visual mapping of the dominant strategic elements was conducted. This visualization includes the distribution of campaign media used, the duration of the interventions, and the level of involvement of cross-sector actors in the implementation process. This presentation is expected to provide a more systematic overview of campaign implementation trends across various geographic and social contexts and serve as a basis for developing more contextualized intervention recommendations, particularly for rural communities and vulnerable groups.

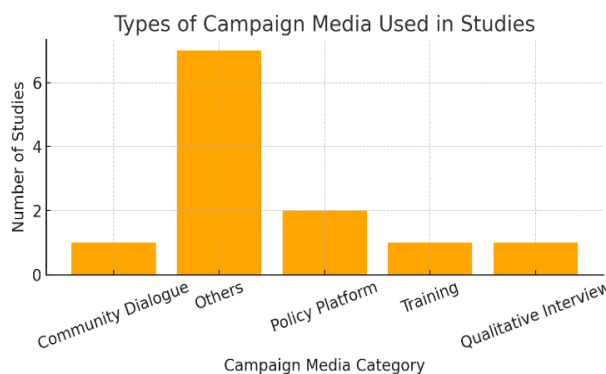


Figure 2. Distribution of campaign media in 12 antibiotic evaluation studies

Figure 2 shows that survey/online media and training approaches were the most commonly used campaign methods in the studies analyzed. Community dialogue-based approaches remain limited, even though they can be more effective in rural communities or minority groups. The variety of campaign media reflects the flexibility of the approach but also demonstrates the potential for expanding the use of locally based strategies.

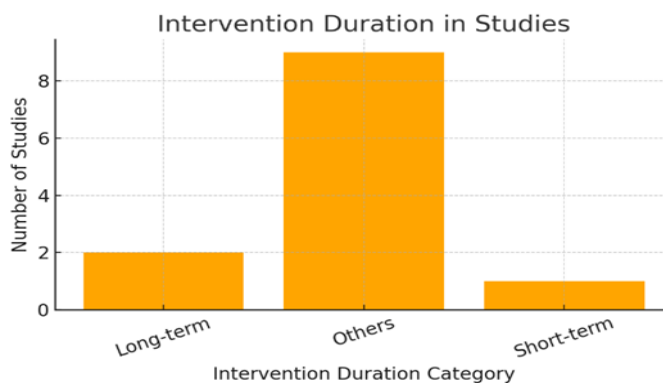


Figure 3. Distribution of intervention duration in the antibiotic campaign study

Figure 3 shows that most studies had short intervention durations, or none at all. Only a small number of studies conducted long-term campaigns. In this regard, repeated and sustained interventions tend to be more effective and impactful in changing community behavior, particularly in rural areas.

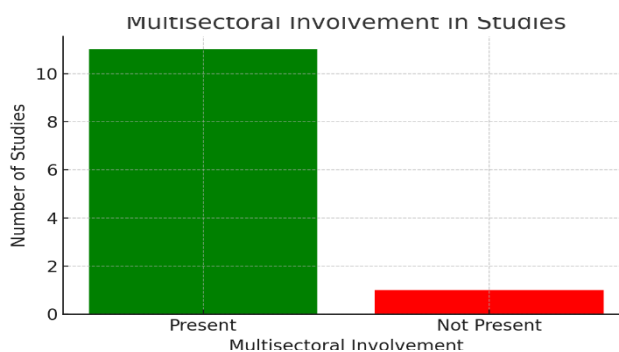


Figure 4. Multisectoral involvement in antibiotic campaigns

Figure 4 shows that nearly all of the studies reviewed involved multisectoral resources, such as academics, government, health workers, and local communities. Only one study did not demonstrate cross-sectoral collaboration. This reinforces the conclusion that cross-sectoral collaboration is key to the effectiveness of antibiotic awareness campaigns, particularly in communities with strong social structures such as villages.

An analysis of various studies related to antibiotic awareness campaigns indicates significant diversity in the approaches and media used. Strategies implemented include the use of online platforms, formal training, and direct communication within communities. Research by Charoenboon et al. (2019) demonstrated the effectiveness of approaches that prioritize local cultural values and contextual narratives, particularly in building emotional engagement among rural communities. (Ratih, Sondarika, Suryana, Ramdani, & Melindawati, 2025), (Nowadays, 2023). In contrast, research by Seaton et al. (2022) shows limitations in the application of community-based participatory approaches. This indicates the importance of developing campaign strategies

that are not informative, but apply to the local social and cultural context in reaching vulnerable community groups more effectively and sustainably.

Intervention duration is a crucial aspect to analyze. In this study, most studies showed that campaigns were short-term and did not explicitly state duration information. Research by Hawkins et al. (2021) provides evidence that long-term interventions have greater potential to drive behavioral change in society. (Harefa et al., 2024), (Prayogo Ogyan, Angkas, Pratisti, Azis, & Nagiri, 2024) Short-term campaigns tend to produce temporary increases in awareness and are therefore insufficient to create lasting behavioral change. In the context of rural communities, which generally have limited access to health information, consistent and repeated interventions are crucial to ensure the message is conveyed. (Azizah, Pt, Sos, & Commun, 2025), (Arindra, Kom, & Kom, 2024). In terms of cross-sectoral engagement as a determinant of campaign effectiveness, the participation of stakeholders such as academics, health workers, local governments, and local communities is demonstrated. This multisectoral collaboration is considered capable of strengthening the legitimacy of campaign messages and facilitating the integration of campaign values into the prevailing social system. Conversely, unilateral interventions without institutional support often do not produce optimal results. Therefore, a systematic collaborative model is needed between local-level implementers for the long-term implementation of community behavior change campaigns.

CONCLUSION

Antibiotic awareness campaigns designed with local context in mind, using a participatory approach, and involving multiple sectors have had a positive impact on changing community behavior. However, sustained intervention and long-term evaluation are needed to ensure the campaign's success in reducing antimicrobial resistance, particularly in rural communities and vulnerable groups.

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