Assessing Community Leaders' Knowledge, Attitudes, and Perceptions on Community-Based Surveillance of Infectious Diseases: Development and Validation of a Questionnaire

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Abstract

Background: Community-based surveillance (CBS) plays a crucial role in disease surveillance, enabling early detection of significant health events within the community, and facilitating timely health interventions. However, there is currently no instrument available to assess the community's knowledge, attitudes, and perceptions regarding CBS. **Objective:** To address this gap, a questionnaire was developed to evaluate the level of knowledge, attitudes, and perceptions of community leaders toward CBS of infectious diseases in Kelantan, Malaysia. **Settings and Design:** A cross-sectional study targeting community leaders in Kelantan state, Malaysia. **Materials and Methods:** The questionnaire development comprised two stages: item development and scale development. Content validity index (CVI) and face validity index (FVI) were employed to ensure content and internal structure validity. The questionnaire covered eight distinct components related to CBS, such as information about infectious diseases, community-level case definition, acceptance, willingness to report, sense of responsibility, impact, support, and perceived benefit. **Results:** Three domains with 98 items were developed. Findings showed robust content validity, with S-CVI scores of 0.96 for all domains. A few items within these domains exhibited disagreement among the expert panel and were subsequently removed, leaving a total of 98 items. The S-CVI values for the individual components ranged from 0.88 to 1.0, indicating strong content validity. Additionally, the FVI score of 0.90 demonstrated high clarity and comprehensibility of the questionnaire. **Conclusions:** The new questionnaire has demonstrated validity in terms of content and face validity for evaluating the knowledge, attitudes, and perceptions regarding CBS of infectious diseases among community leaders.

Keywords: Community-based surveillance, development, infectious disease, KAP, validation

INTRODUCTION

Community-based surveillance (CBS) is defined by the WHO as "the systematic detection and reporting of events of public health significance within a community by community members."^[1] Though CBS is often designed for the routine detection and reporting of infectious diseases, it is a potentially versatile and scalable intervention and has been used for the detection and reporting of non-communicable diseases,^[2,3] monitoring births and deaths,^[4,5] carrying out verbal autopsies,^[6] and more recently, for containing outbreaks of COVID-19,^[7-9] and monkeypox.^[10] A CBS system can: provide early case detection and reporting during disease

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| Quick Response Code: | Website: https://journals.lww.com/mjby | |
| | DOI: 10.4103/MJBL.MJBL_1110_23 | |

outbreaks; monitor events of public health importance in humanitarian emergencies; and supplement nonexistent or limited surveillance coverage in other complex settings.^[11] In addition, CBS is one of the few suitable options for supporting OneHealth surveillance activities

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| Submission: 30-Jul-2023 | Accepted: 07-Dec-2023 | Published: 29-Mar-2025 |
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| How to cite this article | Hasan AA, Bachok N | I, Yaacob NM, Hairon SM, |
| Nadir NAM, Ghazal | AK. Assessing comm | nunity leaders' knowledge, |
| attitudes, and perce | eptions on communi | ity-based surveillance of |
| infectious diseases: I | Development and valio | dation of a questionnaire. |

Med J Babylon 2025;22:156-63.

given its proximity to the interface between humans and animals.^[12,13] Given its potential to enhance the early warning and containment function of national surveillance systems, CBS is increasingly framed as a promising surveillance modality in the discourse around global health security.^[14]

Unlike CBS, the effectiveness of facility-based surveillance systems is largely dependent on context-specific healthcare-seeking behaviors. Many reasons may prevent people with health problems from attending to the health facilities, such as remote areas, limited transportation, or in countries that require out-of-pocket payment for health services. Even in settings with strong facility-based surveillance systems, late presentation of patients with an infectious disease is common and often results in the overrepresentation of late-stage infections that may be difficult and costly to manage. Delayed health seeking may increase community transmission, complicate case investigation and contact tracing, and limit the impact of public health measures such as health education and behavior change initiatives,^[15] vaccination, and antimicrobial prophylaxis. CBS-which involves engaging community members to carry out specific surveillance functions within their own communities-is intended to complement facility-based systems by addressing these challenges, particularly in rural areas within low-resource settings.[16]

From the foregoing, the community plays a vital role in the CBS system, and the awareness of community leaders, in particular, is of utmost importance in establishing effective communication with health facilities. Their awareness contributes to the timely and accurate flow of information, enabling early detection of outbreaks before they reach uncontrollable levels. Consequently, there is a pressing need to develop and validate a comprehensive questionnaire that can assess the knowledge, attitudes, and perceptions of community leaders regarding CBS. To the best of our knowledge, there is no available questionnaire to address this matter. Hence, the primary objective of this study is to create such a tool, which can assess knowledge, attitudes, and perceptions related to CBS in the context of infectious diseases and can be utilized prior to implementing CBS in areas affected by health events.

MATERIALS AND METHODS

The development of the Knowledge, Attitude, and Perception of CBS Questionnaire (CBS-ID-KAPerception) was conducted in two phases. The first phase was the item development, and the second phase consisted of the scale development.^[17] During item development, the domains were identified, and items were generated. The content validity of the questionnaire was assessed. Scale development included face validation to assess the clarity and comprehensibility. The methodology for constructing the CBS-ID-KAPerception questionnaire is presented in Figure 1. The questionnaire covers various components such as information about infectious diseases, community-level case definition, acceptance, willingness to report, sense of responsibility, impact, support, and perceived benefit.

The questionnaire development study was conducted from February until June 2023 in Kota Bharu, Kelantan, using a cross-sectional method. Kelantan was chosen as the study setting due to its diverse population, including both urban and rural areas. This diversity provided an opportunity to explore variations in knowledge, attitudes, and perceptions regarding the study topic across different communities.

Domain identification

A comprehensive literature review, encompassing both quantitative and qualitative studies, was conducted to rigorously define the domains and purpose of the constructs to be developed. Additionally, an extensive investigation of existing questionnaires was carried out to identify relevant domains related to knowledge, attitudes, and perceptions of community leaders, which later can be used as an assessment tool for health education and other interventions. Key words used in the database search were "communitybased surveillance," "people-centered surveillance," "event-based surveillance," "knowledge," "awareness," "attitude"," perceptions," and "KAP."

PubMed, Scopus, and Google Scholar were utilized as databases and search engines in this study. However, no specific questionnaire was identified to address the study objective. Consequently, relevant studies focusing on CBS were examined to determine the key elements to be incorporated into the newly developed questionnaire. The development process also drew upon theoretical background such as the theory of planned behavior (TPB)^[18] and the health belief model (HBM)^[19] to provide a strong theoretical framework. A meeting among the research team members was conducted to verify all the domains and some modifications from their views were considered and gathered to make sure all domains are representative, easy, and understandable.

Each contributed domain was appraised several times until all members agreed to focus on a number of identified domains. Blueprint of each domain was developed based on comprehensive review by research team members and subdomains were identified for each of the main domains (knowledge, attitudes, and perceptions). These subdomains are information about infectious diseases, community-level case definition under (knowledge), then a sense of responsibility, acceptance, and willingness to report under (attitudes), followed by impact, support, and perceived benefit under (perceptions).



Figure 1: Flowchart of CBS-ID-KAPerception development

Item generation

Item generation was based on a literature review and discussions with experts. Several guidelines and references were used to gather important information in generating appropriate items such as; technical guidelines for integrated disease surveillance and response in the African Region,^[20] CBS Assessment tool,^[21] CBS: guiding principles,^[22] CAHWs),^[23] Evaluation of community-based surveillance for Guinea worm, South Sudan, 2006,^[24] Integrated diseases surveillance and response in the African region: Community-based surveillance (CBS) training manual^[25] community epidemic and pandemic preparedness program.^[26] The questionnaire development process involved a series of discussions with a multidisciplinary team consisting of public health specialists (4 in the first round and 4 in the second round), biostatisticians (2 and 1 in the first and second rounds), and 5 religious community leaders. These individuals were chosen for their expertise and experience related to the concepts being measured in the newly developed questionnaire. The discussions aimed to gain insights into their perceptions and attitudes toward CBS. The information gathered from these discussions was used to formulate relevant constructs for the questionnaire. After careful consideration, rewording, rephrasing, and adjustments were made to ensure the items were free from bias and ambiguity. As a result, a total of 98 items

were included in the questionnaire, with 45 items for the knowledge domain, 30 items for the attitudes domain, and 23 items for the perceptions domain. The specific objectives and corresponding items for each component of the knowledge, attitudes, and perceptions domains are summarized in Table 1.

Questionnaire translation

The questionnaire was initially developed in the English language and later translated into Malay.

The initial English version of the CBS-ID-KAPerception questionnaire underwent several steps to ensure its accuracy and linguistic quality. Firstly, it was reviewed by an English language expert for proofreading. Subsequently, a forward translation process was carried out by a bilingual translator. Following this, a meeting was conducted with the research team to revise and make necessary corrections and adjustments to both the Malay and English versions, particularly focusing on medical terminology. Finally, the researcher double-checked the final Malay draft to prepare for the backward translation.

Following the reconciliation and editing process, the draft of the questionnaire was subjected to backward translation into the English language. To ensure accuracy and maintain

| Domain | Components | Objectives | Items |
|------------|---------------------------------|--|--------------------------------|
| Knowledge | Information about | •To assess knowledge about the infectious disease | •Ki1-Ki32 |
| The medge | infectious diseases | •To assess knowledge about CBS of infectious diseases | •Ki33-Ki35 |
| | Community-level case definition | •To assess knowledge about case definition of infectious disease at the community level | •Kd36-Kd45 |
| Attitude | Acceptance | •To assess the positive acceptance of CBS | •Aa1-Aa3, Aa5-Aa7, A9-Aa10 |
| | | •To assess the negative acceptance of CBS | •Aa4, Aa8 |
| | Willingness to report | •To assess positive attitude in terms of willingness to report health events to health authorities | •Aw11-Aw13, Aw15-Aw17 |
| | | •To assess positive attitude in terms of willingness to report health events to health authorities | •Aw14 |
| | Sense of responsibility | •To assess positive attitude in terms of sense of responsibility to report health events to health authorities | •Ar18-Ar21, Ar23-Ar26, Ar29 |
| | | •To assess negative attitude in terms of sense of responsibility to report health events to health authorities | •Ar22, Ar27, Ar28, Ar30 |
| Perception | Impact | •To assess positive perception in terms of impact of CBS in the community | •Pi2, Pi3, Pi6-Pi9 |
| | | •To assess negative perception in terms of impact of CBS in the community | •Pi1, Pi4, Pi5 |
| | Support | •To assess positive perception in terms of supporting health facilities | •Ps10, Ps11 |
| | | •To assess negative perception in terms of supporting health facilities | •Ps13-Ps15, Ps18 |
| | Perceived benefit | •To assess perception in terms of supporting health facilities | •Pb19-Pb23 |

Table 1: Second round: Final objectives and items for each component of the knowledge, attitudes, and perceptions domains

linguistic rigor, a different bilingual translator, who was an English language expert from the language institution at Universiti Sains Malaysia, was involved in this stage. The research team held discussions and deliberations to finalize the second draft of the questionnaire, considering the independent translations that were conducted previously.

Cognitive debriefing

The final version of the questionnaires was obtained by incorporating inputs from the original version, back translation, and forward translation. A collaborative meeting was conducted, involving the translators responsible for the forward and backward translation, as well as experts in the field of public health and infectious diseases with expertise in questionnaire designing. During this meeting, a comprehensive evaluation of the Malay version of all the measures was carried out, focusing on cultural appropriateness and clinical relevance. As a result, the final versions of the questionnaires were deemed suitable for further assessment through content validation and face validation within the target population.

Content validation

The content validation process involved two rounds of assessment by two expert panels to evaluate the relevance and representativeness of each item within its specific domain. The first panel consisted of six experts, including four public health physicians, an infectious disease epidemiologist, and a biostatistician. Each expert rated the items on a Likert scale ranging from 0 (not relevant or not representative) to 4 (highly relevant or highly representative). Based on the panel's recommendations and discussions in several meetings, items were refined, reworded, rephrased, and adjusted to minimize bias and ambiguity. Subsequently, the research team proposed subjecting the questionnaire to another round of evaluation by a second panel of experts. This panel consisted of five public health experts affiliated with reputable institutions such as the Malaysian Ministry of Health (KKM), the Public Health Department in Kelantan, and the Department of Community Medicine at USM. Their expertise in the field of public health provided valuable insights and perspectives on the questionnaire's content and relevance. During the final meeting, the ratings provided by the panel members were compiled and entered into Microsoft Excel. Item-level content validity index (I-CVI), scale-level content validity index (S-CVI), scale-level content validity index with universal agreement calculation method (S-CVI/UA), and scale-level content validity index with averaging calculation method (S-CVI/ Ave) were calculated. S-CVI/Ave was calculated using two formulas according to Saiful and Yusoff.[27]

I-CVI = (agreed item)/(number of rater)

S-CVI/Ave = (summation all I-CVI)/ (number of item)

The first approach involved calculating the I-CVI value by dividing the sum of individual item agreement scores by

the total number of experts. The second approach involved determining the average proportion of agreement for each rater. The S-CVI/UA was then calculated by determining the number of items with 100% agreement and dividing it by the total number of items in the specific domain.

For content validity, a newly developed tool should achieve at least 80% (0.8) or higher agreement.^[17] In this study, relevant and representative items, including both positively and negatively worded items, were identified to ensure comprehensive coverage.^[28]

Scale development

Face validation was conducted to ensure that respondents interpreted the items in the manner as intended. This stage highlighted items that were inappropriate at a conceptual level, besides addressing areas such as ambiguous, leading, confusing, difficult, sensitive, and missing questions.

During face validation, 10 community leaders from Kota Bharu district were selected by convenience sampling and they were interviewed to check their understanding and agreement on the comprehensiveness and clarity of the questionnaire items. The items were rated based on a Likert scale ranging from 0 (i.e., difficult clarity and difficult comprehensibility) to 4 (i.e., easy clarity and easy comprehensibility). The raw scores were entered in Microsoft Excel and calculated for the item-level face validity index (I-FVI) for each comprehensibility and clarity. The acceptable cutoff score of FVI is at least 0.80.^[17] The formula for FVI calculation is as follows:

FVI = (summation of FVI score)/(max score × number of rater)

The standard scoring for the knowledge, attitudes, and perceptions domains was achieved by a meeting with the research team members. The need for a scoring system and each item was examined item-by-item before the final decision.

Ethical approval was obtained from the Ethical Committee, Universiti Sains Malaysia USM/JEPeM/22050317.

RESULTS

Sections of the questionnaire

The questionnaire comprises four sections. Section A collects information on socio-demographic characteristics such as age, gender, ethnicity, marital status, occupation, education level, and the source of information about infectious diseases and CBS. Section B focuses on general knowledge related to infectious diseases and the CBS system. Section C assesses attitudes toward CBS. In Section B, response options include "yes," "no," and "I don't know." Sections C and D utilize a 5-point Likert scale. The questionnaire was initially written in English and subsequently translated into Malay language.

Content validation index (CVI)

To ensure comprehensive coverage of each construct and facilitate the item reduction process, a large pool of questions was generated. The content and face validation processes were employed, involving two rounds of validation. In the initial round, the questionnaire, comprising 116 items, was assessed by six experts, resulting in a S-CVI of 0.78. Subsequently, the questionnaire was revised based on the recommendations from the first panel, leading to an improved overall S-CVI of 0.82. As recommended by the research team, following the implementation of amendments to the initial questionnaire draft, a second rounds of content validation was conducted, In the second round, a panel of five experts evaluated the revised questionnaire, yielding a high S-CVI of 0.96.

The domain of knowledge toward CBS was divided into two components: Information about Infectious diseases and CBS, and community-level case definition. Similarly, the domain of attitude included three components: Acceptance, willingness to report, and sense of responsibility. The perception domain encompassed three components as well: Impact, support, and perceived benefit. Table 2 presents the CVI scores for each component in the three domains. In the Information about Infectious diseases & CBS component, 35 items surpass the acceptable level of Scale-level content validity index (S-CVI/Ave = 0.95). For the community-level case definition component, 10 items exceeded the acceptable level of S-CVI/Ave (S-CVI/Ave = 0.94).

Regarding the component of Acceptance in the attitude domain, a total of 10 items were identified and achieved an acceptable level of agreement among experts (S-CVI/ UA = 0.8). The overall S-CVI/Ave for this component was 0.96, indicating good agreement among experts. The component of willingness to report also demonstrated a universal agreement of 0.86, with a S-CVI/Ave of 0.94. Similarly, the component of Sense of responsibility achieved a universal agreement of 0.92, with an S-CVI/ Ave of 0.98.

In the domain of perceptions, the Impact component demonstrated a universal agreement of 0.89 among experts, indicating a substantial level of consensus. The S-CVI/Ave for this component was 0.98, indicating a high level of agreement. In the component of Support, all nine items achieved acceptable universal agreement between experts (S-CVI/UA = 1.0), suggesting a unanimous consensus on their relevance to their respective domains. Similarly, the component of Perceived benefit also attained a perfect universal agreement (S-CVI/UA = 1.0), as all experts agreed that all the items were pertinent to the domain.

A total of 28 items were excluded from the initial version of the questionnaire based on feedback from experts, whereas 8 additional questions were incorporated. As a

| lable 2: First and second round of content validation | | | | | | | | |
|---|-----------------------------|---------------|---------------------------------------|------------------------------|--------------|---------------|---------------------------------------|-------------------------|
| | First round CVI (6 experts) | | | Second round CVI (5 experts) | | | | |
| Components | S-CVI/ UA | S-CVI/ Ave | Average proportion of items judged | No. of removed items | S-CVI/ UA | S-CVI/ Ave | Average proportion of items judged | No. of removed items |
| Information about infectious diseases | 0.59 | 0.88 | 0.88 | 7 | 0.80 | 0.95 | 0.95 | 0 |
| Source of information | 0 | 0.62 | 0.61 | 13* | _ | _ | - | _ |
| Community-level case definition | 0 | 0.62 | 0.10 | 0 | 0.50 | 0.88 | 0.88 | 0 |
| Acceptance | 0.33 | 0.80 | 0.80 | 0 | 0.8 | 0.96 | 0.96 | 0 |
| Willingness to report | 0.14 | 0.71 | 0.72 | 0 | 0.86 | 0.94 | 0.94 | 0 |
| Sense of responsibility | 0.1 | 0.61 | 0.61 | 6 | 0.92 | 0.98 | 0.98 | 0 |
| Impact | 0.63 | 0.92 | 0.92 | 0 | 0.89 | 0.98 | 0.98 | 0 |
| Support | 0.17 | 0.78 | 0.78 | 3 | 1 | 1 | 1 | 0 |
| Perceived benefit | 0.33 | 0.83 | 0.83 | 1 | 1 | 1 | 1 | 0 |

*The domain of (source of information) has been removed to proforma

result, the final draft of the questionnaire comprised a total of 98 items.

Face validation index (FVI)

FVI was assessed among a sample of ten community leaders residing in Kelantan, selected through convenient sampling. The FVI, indicating the level of clarity and comprehensibility, was found to be 0.90. The FVI scores for each subdomain are presented in Table 3.

DISCUSSION

CBS system holds significant importance in the field of public health. It is widely recognized that involving communities as partners in a multisectoral One Health approach to surveillance is considered the best approach^[29] The development of the CBS-ID-KAPerception questionnaire aims to assess the knowledge, attitude, and perceptions of community representatives regarding CBS. This assessment is crucial in enhancing the early detection of infectious diseases before they reach uncontrollable levels.^[30] The items included in the questionnaire were developed based on established guidelines, ensuring strong content validity. It is important to emphasize that content validity serves as a fundamental requirement for establishing other forms of validation process; therefore, should be prioritized during the development process of any new tool.[31]

Knowledge

In the first round, the research team decided to remove item k31 (Avoid swimming in contaminated water) from the questionnaire as it was deemed a leading question and could potentially result in a ceiling effect. This was because the local population was already well aware of the connection between infectious diseases and swimming in

Table 3: Face validation index by 10 respondents

| Components | FVI average | | |
|---------------------------------------|-------------|--|--|
| Information about infectious diseases | 0.93 | | |
| Community-level case definition | 0.95 | | |
| Acceptance | 0.90 | | |
| Willingness to report | 0.84 | | |
| Sense of responsibility | 0.86 | | |
| Impact | 0.93 | | |
| Support | 0.86 | | |
| Perceived benefit | 0.93 | | |

contaminated water, particularly in the context of floods.^[32] Additionally, items k32, k33, k34, k35, and k36, which were related to the definition of CBS, were excluded from the questionnaire due to concerns about their accuracy. Instead, the research team rephrased the definition of CBS and introduced items Ki33, Ki34, and Ki35 to assess participants' understanding of CBS.^[1] Notably, Ki35 was included as a negative question to mitigate potential habitual bias. Item Ki32 (use antibiotics for all types of infections) was added as a negative question for the same reason.

Since information about infectious diseases can be obtained from multiple sources simultaneously,^[33] the decision was made to transfer the items pertaining to the "source of information" domain (K38-K50) to proforma. This approach allows for a more comprehensive assessment of the various sources individuals rely on to acquire information about infectious diseases.

Attitude

Item A19 (I go to work even if I have signs and symptoms of an infectious disease) was excluded from the assessment of attitude as it was deemed more suitable at the personal level. Similarly, items A27-A29 (If I or one of my family members developed a prolonged fever, I will: a) Visit a physician immediately, b) take antipyretic, c) Keep monitoring at home) were initially included to capture the participants' sense of responsibility.^[16] However, these items were subsequently removed due to their low relevance as determined by the expert panel. The research team also identified that these items were overly broad in scope, further justifying their exclusion from the assessment.

Perceptions

The perception domain underwent some modifications to improve its relevancy and precision, the domain has S-CVI of 0.83, which is considered acceptable according to Yusof et al.[17] However, Item P16 (I know most infectious diseases within my community) was removed from the assessment since community leaders typically do not possess medical training as supported by^[30] and are not required to have extensive knowledge of infectious diseases. Similarly, item P19 (Health facilities also provide counseling services) was eliminated due to its low I-CVI of 0.50 and its lack of alignment with the domain of "support." The research team also identified item P20 (Engaging in outbreak control will endanger my life) as non-relevant, given its overly strong statement that could potentially lead to ceiling or flooring effects. Furthermore, item A26 (Reporting health events is unbeneficial) was excluded to mitigate the influence of social desirability bias.

Regarding the response process, as indicated by the Face Validation Index (FVI), the 98 items demonstrated a high level of face validity, suggesting that they were deemed clear and comprehensible by the participants. This indicates a favorable response process within the study.^[27]

This study demonstrates that CBS-ID-KAPerception questionnaire possesses satisfactory content and face validity for evaluating the knowledge, attitudes, and perceptions of community leaders regarding CBS of infectious diseases. yet, additional evaluation is necessary to establish its construct validity. It may prove beneficial for health professionals involved in implementing health interventions related to CBS, such as health education, as well as assessing the community's readiness to adopt CBS systems in their respective areas. Furthermore, this tool can be utilized to evaluate the effectiveness of such interventions.^[34] However, there are limitations that should be considered due to it being a self-administrated questionnaire, such as the possibility of self-reporting bias, response rate, and non-response bias, or provide socially desirable responses. Efforts should be made to consider different strategies to minimize biases, such as ensuring anonymity and confidentiality and use clear and unbiased language in the questionnaire.

In conclusion, the CBS-ID-KAPerception questionnaire, a recently developed tool, has demonstrated favorable

content and face validity for evaluating the knowledge, attitudes, and perceptions of community leaders regarding CBS of infectious diseases. The content validity of the questionnaire has been assessed through two expert panels, and face validation conducted with community leaders, including imam masjids and village leaders.

Financial support and sponsorship

This research received no external funding.

Conflicts of interest

There are no conflicts of interest.

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