Original Article

Validity of the COVID-19 preparedness e-module developed using ADDIE method for Dasa Wisma cadres in Jakarta

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Abstract

Background & Objective: The high number of COVID-19 cases in Jakarta is due to inadequate pandemic preparation. Educating community figures using a content-verified e-module is one way to improve the community's preparedness for the COVID-19 pandemic while adapting to the changes brought on by the pandemic. This study aimed to evaluate the validity of the COVID-19 preparedness e-module for dasa wisma cadres, who are the heads of several households grouped in a Dasa Wisma group.

Materials & Methods: Using the analysis, design, development, implementation, and evaluation (ADDIE) method, a COVID-19 preparedness e-module was developed for the dasa wisma cadres. Enumerators (n = 2), respondents (n = 20), and experts (n = 11) conducted the evaluation asynchronously using online communication software. Enumerators evaluated one variable, respondents evaluated four, and experts evaluated eight. The evaluation utilized a 4-point Likert scale.

Results: The evaluation yielded the following results: comprehension (3.40), attractiveness (3.70 & 3.72), acceptance (3.65 & 3.78), involvement (3.50 & 3.49), inducement (3.60 & 3.29), clarity (3.60), sufficiency (3.51), coherence (3.62), and significance (3.63). (3.80). The outcomes were reliable (3.28–4.00; variance 0.72).

Conclusion: The COVID-19 preparedness module is valid for enhancing COVID-19 preparedness.

Keywords: ADDIE, COVID-19, Education, E-module, Public Health, Validity

Introduction

The COVID-19 pandemic is a threat to all countries, including Indonesia. Jakarta has the most confirmed COVID-19 cases, with 402,376 confirmed cases as of April 22nd, 2021, with 6,550 deaths and a case fatality rate of 1.63% (1). The high number of COVID-19 confirmed cases might be due to the community's low level of preparedness for COVID-19 (2). COVID-19 preventive measures at the individual level include vaccination, avoiding crowds, maintaining hand hygiene, social distancing, and closing public facilities and workplaces (3, 4). At the community level, maintaining COVID-19 preparedness is critical to reducing COVID-19 (5). COVID-19 preparedness can be assessed from the community's knowledge, attitudes, and behavior toward COVID-19 (6). In Indonesia, knowledge is an important variable affecting COVID-19 transmission in the community (7). Online training is one of the efforts to increase knowledge, attitudes, and behavior (8, 9). During the COVID-19 pandemic, online training is the safest and most preferred choice to minimalize the risk of COVID-19 transmission (10).

On the other hand, misinformation about medical science is rampant on the internet, threatening public health information and, ultimately, medical science education

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(11). Medical science and public health education should not be seen as two distinctive academic entities but as one big integrated health science. Integrating the development of medical education and community health education is essential in improving the country's public health status (12). Currently, medical science education in the community health paradigm is lacking and fragmented, and there is currently no validated educational module that can be used as suitable COVID-19 teaching material to empower community health as a part of medicine.

The ADDIE method is a comprehensive educational development framework in that all the phases may be readjusted to any stimulus so that complexities during traditional curriculum development may be avoided (13). The method has been applied to various academic fields (13– 15). However, it is essential to note that the e-module must be visually appealing so that target populations are interested in learning the e-module (16). Visual design and layout are vital aspects of learning and cognitive processes since vision contributes to 80% of information processed by the brain(17, 18). Poorly designed online teaching material may distress the learners, resulting in losing interest in learning the e-module (19).

The concept of "governing from below" states that training for the community will be better if carried out at the grassroots level (20). A Dasa Wisma is a group of 10 to 20 houses formed within the context of a neighborhood and adapted to local circumstances. Kader Dasa Wisma or dasa wisma cadre refers to the leader of a Dasa Wisma. Cadres are expected to be the agents of change in their respective environments (21, 22). Cadres are a vital component of public health, and how they educate and influence communities under their jurisdiction affects how the communities perceive medical science and education (23). In the context of the COVID-19 pandemic, educating dasa wisma cadres is essential to facilitate health behavior change within the community to minimize the spread of the virus (24). Considering all these findings, providing cadres with well-developed medical science education materials about COVID-19 will pave the way for improving the public health of communities under their jurisdiction. However, no valid e-module may currently be utilized as medical education material for the dasa wisma cadres. Thus, this study evaluated the validity of the ADDIE-developed COVID-19 preparedness e-module for dasa wisma cadres. This test is necessary to determine whether this attractively designed e-module is valid and applicable.

Materials & Methods

Design and setting(s)

The validity of the COVID-19 preparedness e-module was initially determined through formative research. It collects validity assessments and virtual interviews for formative research and combines them with descriptive analysis designs. The research was conducted by distributing questionnaires containing test variables via e-mail, WhatsApp group, and Google Meet software for online meeting interviews. Virtual interviews or focus group discussions (FGDs) with experts (i.e., logical validity) or users (i.e., face validity) are among the most widespread qualitative research methods (25).

Participants and sampling

The study respondents were dasa wisma cadres in Jakarta, randomly selected from 76, 114 cadres in 274 urban villages. Forty participants were chosen randomly based on the formative study's inclusion criteria. Twenty respondents were selected at random from all formative research respondents (n= 40) and divided into a control group (n= 10) and an intervention group (n= 10), which would be included in the virtual survey to test the validity of the e-module. Respondents were not allowed to communicate with one another to prevent information bias.

The inclusion criteria were: 1) Dasa Wisma cadres; 2) aged 18-64 years old; 3) minimum educational level of high school or equivalent; 4) living with family (parents, husband, children); 5) having a device with internet access (notebook, cellphone, computer); 6) having a device which can take photos and videos, and; 7) received an operational budget from Dinas Pemberdayaan, Perlindungan Anak Dan Pengendalian Penduduk Jakarta (DPPAPP Jakarta) every month, having a Whatsapp account. The exclusion criteria were: 1) not a healthcare worker; 2) had never been a COVID-19 preparedness training instructor; 3) have close contact with COVID-19 confirmed patients in the past 14 days; and 4) have COVID-19 related symptoms (fever, cough, runny nose, muscle pain, loss of smell, skin rash).

Tools/Instruments

The COVID-19 preparedness e-module was prepared and developed using the ADDIE method. It was arranged in four parts: overview, signs and symptoms, prevention, and management. The stages of the preparation of the e-

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module developed through the ADDIE model were as follows (Figure 1) (26).

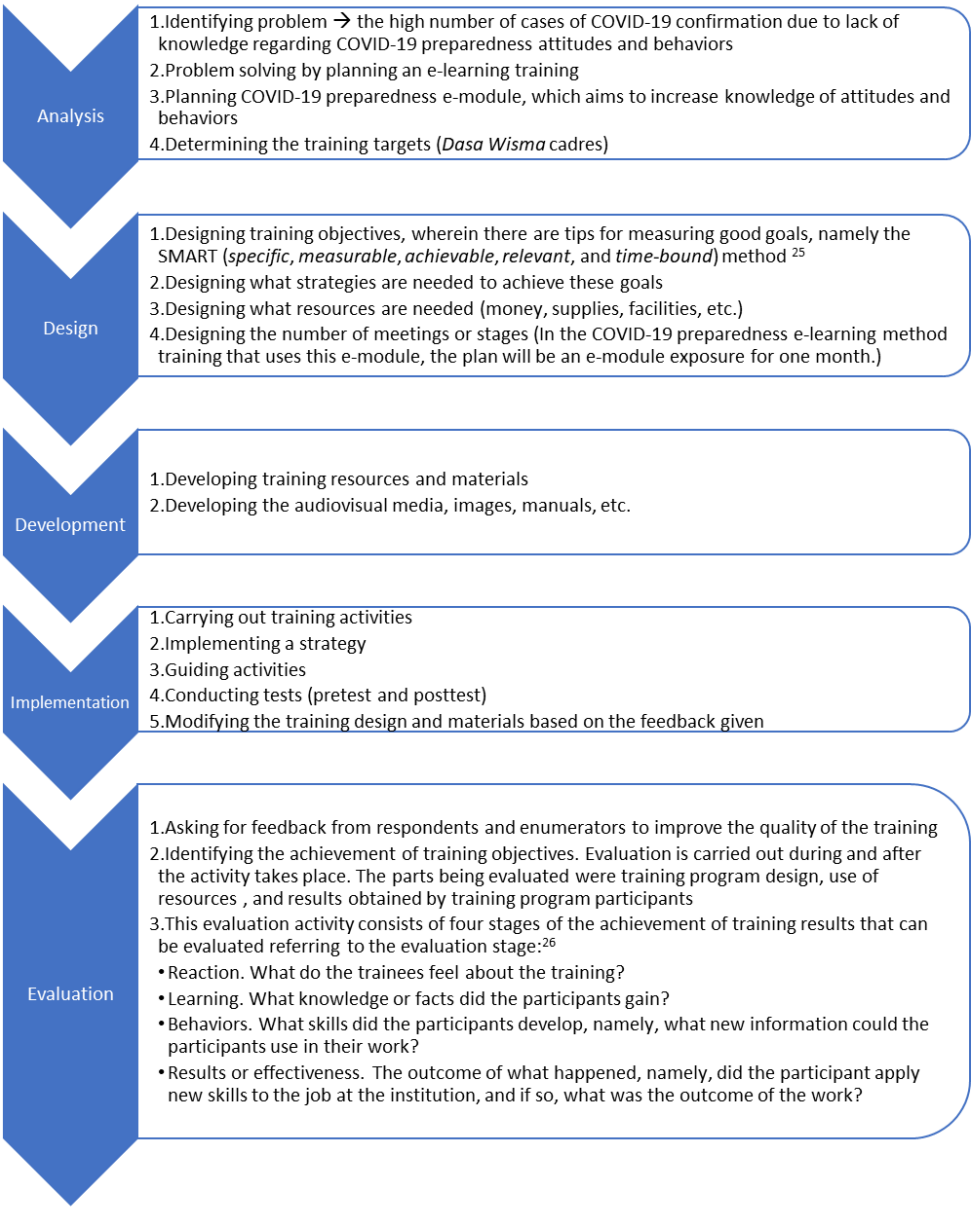

Figure 1. Process of developing COVID-19 preparedness e-module for *dasa wisma* cadres in Jakarta

Nine variables were assessed: five mentioned by Parvanta et al. in 2010 (27) and four others by Fernandez-Gomez et al. in 2020 (28). The five variables mentioned by Parvanta et al. in 2010 (27) are comprehension, attractiveness, acceptance, involvement, and inducement. Fernandez-Gomez et al. (2020) (28) mentioned four other variables: clarity, sufficiency, coherency, and relevancy. There are three groups of validity assessors totaling 33 individuals: enumerators (n= 2), respondents (n= 20), and experts (n= 11). Policy (n= 4), the media (n= 3), and science (n= 4) are the disciplines represented by the experts evaluating the validity of this statement. Enumerators (n= 2) and respondents (n= 20) examined the face validity of the content validity, while experts (n= 11) examined the logical validity. The study instrument is a questionnaire developed using Google Forms. The questionnaire consisted of identity and the test variables, including attractiveness, acceptance, involvement, inducement, clarity, sufficiency, coherency, and relevancy. E-mail,

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WhatsApp Group, and Google Meet were utilized for the validity examination. The enumerators created the WhatsApp Group. Then, the respondents were invited to join the WhatsApp Group. The e-mail was used to collect the validity test scores from experts. WhatsApp Group and Google Meet were required for group member communication and data transfer. Invitations to e-modules and Google Meet were the information shared within the WhatsApp Group.

In the interim, a Google Meet was required to collect validity test scores via a virtual survey and introduce the e-module to the intervention group. Enumerators and respondents can interact in real time via Google Meet, although they are not physically present. In addition, respondents can pose questions to the enumerators during the presentation of the e-module.

Table 1. Test variables examined by each examiner

Variable	Operational definition	Examiner		
		Enumerators (*n*= 2)	**Respondents (*n*= 20)**	**Experts (*n*= 11)**
Comprehension	Audiences master the content of existing material.	+	-	-
Attractiveness	The e-module is attractive enough to attract learners.	-	+	+
Acceptance	Some elements can be accepted in terms of norms (culture, religion), attitudes, and beliefs of the audience.	-	+	+
Involvement	There is audience involvement.	-	+	+
Inducement	There is encouragement for the audience to do something.	-	+	+
Clarity	The language, graphics, and images used in the e-module are clear.	-	-	+
Sufficiency	The content is complete.	-	-	+
Coherency	Harmony and consistency exist in the contents of the e-module.	-	-	+
Relevancy	There is a connection between the contents of the e-module and the main topic.	-	-	+

Data collection methods

Data collection, particularly for validity tests, was conducted in two ways. Using the first method, two enumerators and twenty respondents used Google Meet to conduct a virtual survey. Eleven specialists completed the second method by completing an online questionnaire sent via e-mail. There is no data collection for validity testing via WhatsApp Group (28– 30).

Data analysis

Like data collection, data assessment is conducted in two ways. The first assessment was the virtual survey, conducted as follows: (1) Enumerators and respondents met virtually in the Google Meet application. (2) There were two enumerators. Each of them met with ten respondents for approximately 15 minutes. (3) The enumerator read several questions prepared in the interview guidelines to the respondents. (4) The respondents answered the enumerator's questions. (5) The enumerator scores the respondents' comprehension of the module content. (6) The enumerator noted the respondents' four variables (attractiveness, acceptance, involvement, and inducement). The enumerator was trained beforehand to get a common perception and avoid information bias.

The second assessment was through the online questionnaire: (1) The module and assessment sheets were sent to the experts via e-mail. (2) The experts made assessments and filled out the assessment sheets. (3) The assessment sheets were sent back to the researcher. (4) The assessment sheets were documented in a table

Assessment Standards

Assessment for the quantitative study used a 4-point Likert scale. This scale is believed to reduce bias compared to a 5-point Likert scale. The validity test assessment used the interval, according to Pimentel. (Table 2) (31).

Table 2. Standard of description and assessment interval of the 4-point Likert scale validity test according to Pimentel classification (32)

Likert scale	Interval	Difference	Description
1	1.00–1.75	0.75	Strongly not valid (SNV)
2	1.76–2.51	0.75	Not valid (NV)
3	2.52–3.27	0.75	Valid (V)
4	3.28–4.00	0.72	Strongly valid (SV)

Results

The validity test results of the COVID-19 preparedness e-module for Dasa Wisma cadres by enumerators, respondents, and experts are described below. The higher the enumerator score, the higher the validity. A mean score of 3.40 was obtained, indicating solid validity (refer to Table 2). The complete results can be observed in Table 3.

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Table 3. Validity test results by enumerators

Variable	Likert scale	Number of respondents		Total enumerator score	
		Enum 1	Enum 2	Enum 1	Enum 2
Comprehension	1	0	0	0	0
	2	0	0	0	0
	3	7	5	21	15
	4	3	5	12	20
Total		20		68	
Mean enumerator score		3.40 (SV*)			

*SV = Strongly Valid (according to Pimentel classification)

The respondents assessed attractiveness, acceptance, involvement, and inducement variables after reading the e-module. The enumerators collected the scores by asking each of them the Google Meet virtual survey questionnaires. The examples of the questionnaires were "How attractive is the e-module according to you?", "What attracts you the most from the e-module?" and "What score do you give for the attractiveness of the e-module using the 4-point Likert Scale?". The validity of all four variables was rated as strongly valid in Table 2. Table 4 details the complete validity test results of the four variables.

Table 4. Validity test results by respondents

No	Variable	Number of Respondents per Likert scale				Total Number of Respondents	Mean score of respondents per variable
		1	2	3	4		
1	**Attractiveness**	0	0	6	14	20	3.70 (SV*)
2	**Acceptance**	0	0	7	13	20	3.65 (SV*)
3	**Involvement**	0	0	10	10	20	3.50 (SV*)
4	**Inducement**	0	0	8	12	20	3.60 (SV*)
Mean respondent score							3.61 (SV*)

*SV = Strongly Valid (according to Pimentel classification in Table 1).

Eleven experts assessed eight variables: attractiveness, acceptance, involvement, inducement, clarity, sufficient, coherency, and relevancy. The validity of the e-module was assessed by scoring each variable in the assessment sheet. The collected data is described in Table 5. Strongly valid results were found for all eight variables as rated by the experts.

Table 5. Validity test results by experts

No	Variable	Score per variable per expert											Mean expert score per variable
		1	2	3	4	5	6	7	8	9	10	11	
1	**Attractiveness**	4	3.8	3	3	4	4	4	4	4	3	4	3.71 (SV*)
2	**Acceptance**	3	3.6	3	4	4	4	4	4	4	4	4	3.78 (SV*)
3	**Involvement**	3	3.4	3	4	3	4	4	4	4	4	3	3.49 (SV*)
4	**Inducement**	3	3.2	3	4	3	4	3	3	3	3	4	3.29 (SV*)
5	**Clarity**	4	3.6	3	4	4	3	3	4	4	4	3	3.60 (SV*)
6	**Sufficient**	4	3.6	3	3	3	4	3	4	4	4	3	3.51 (SV*)
7	**Coherency**	3	3.8	3	3	4	4	3	4	4	4	4	3.62 (SV*)
8	**Relevant**	4	3.8	3	4	3	4	4	4	4	4	4	3.80 (SV*)
Mean expert score													3.60 (SV*)

Discussion

Assessment of the validity of the COVID-19 preparedness module using 4-point Likert scales and standards by the enumerators, respondents, and experts yields high validity. As assessed by the enumerators, the validity of the respondents' understanding of the e-module is very high (3.40). According to the respondents, the attractiveness variable had the highest value (3.70), while the involvement variable had the lowest (3.50). The more attractive an e-module is, the easier learners can understand the contents (16). This phenomenon is illustrated by the comprehension scores assessed by the enumerators. According to the experts, the relevancy variable had the highest value (3.80), and the inducement variable had the lowest (3.29). The relevancy variable is crucial in developing an e-module and the learning process. These show that the COVID-19 preparedness module developed using the ADDIE method is valid and acceptable to respondents. These results were in line with the recent studies about e-module developed with the ADDIE method, indicating high learnability of the e-module (33, 34).

The transition to online or virtual learning during the COVID-19 pandemic may serve as a precedent for more

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accessible education. Online learning allows educators to reach more learners with higher learnability and lower cost. Thus, online learning, such as using an e-module, may bridge the gap between the increasingly digital learning resources and the unmet demand for access to adequate education, especially in developing countries and regions with special needs, such as remote areas and refugee camps. Educators may share learning materials with learners with increasingly easy-to-use online social platforms more quickly. Other advantages of online learning are flexibility, which can be done anytime, reduced accommodation costs, and applicability for people with special needs (35).

The successful utilization of online learning during the COVID-19 pandemic depends on the learners' and teachers' readiness. E-module has been proven to be a valid and effective education modality in the face of pandemic (36, 37). Using an e-module fostered study motivations, independent learning, enhanced learning outcomes, and learned skills (38). The sudden emergence of the COVID-19 pandemic resulted in the abrupt transition to online education. As such, learners and teachers may feel unprepared for these unforeseen circumstances. As much as 86.9% of teachers and 87.1% of students preferred classroom learning compared to online learning (39). Many teachers were not confident in online learning and agreed that online learning is not an adequate alternative to face-to-face learning (40). This may be mitigated with a thoroughly prepared e-module, as it acts as the primary learning guide for students in online learning. In medical education, an effectively structured e-module with high clarity of the written contents and information strongly correlates with effective online learning for students (41). Dunne et al.(2020) found that e-module-based learning may significantly increase medical student understanding of basic concepts (42). Highly engaging online learning materials with high participation and involvement significantly correlate with students' satisfaction and performance (43). Thus, an appropriately designed and validated e-module will significantly affect readiness, participation, engagement, and satisfaction (44).

During the pandemic, there is an increasingly high demand to change the educational method into a virtually-oriented classroom (13). Much preparation is needed to develop an e-module. One of the methods for preparing and developing an e-module is the ADDIE method (26,45). The analysis phase identifies the learning objectives and instructional materials necessary to achieve the desired outcome. The educational objectives may be determined using various methods, including expert consensus, surveys, and graduates' opinions from the program or a related field. During the design phase, educators determine the optimal method for delivering instructional material based on the learner and the learning objectives. Educators continue to plan and implement the selected design during the development phase after the finalized module design. The educators then enter the implementation phase, where they instruct the students on the learning materials. After that, educators receive feedback on the teaching process during the evaluation phase and make modifications to the prepared module based on the received feedback (45).

The ADDIE framework is highly beneficial in creating a strongly valid module for online learning, as found in this study. Results obtained by previous studies also support this finding. ADDIE-based online learning materials met the required standard to be used as online learning material in the context of medical science (14). The online learning module developed with the ADDIE method is highly valid as online learning material during the COVID-19 pandemic (46). ADDIE-based e-module was found to increase students' learning motivation (47). Successful utilization of e-module in medical education may effectively fill in the knowledge gaps that the majority of medical students had in varying contexts of medical education (48–52). These findings indicate that the ADDIE framework is appropriate to be applied as an online teaching material development framework to adapt to the rising importance and demand of online learning.

To our knowledge, there is currently no valid COVID-19 medical education material for the dasa wisma cadre, even considering its vital importance. Past evidence found the effectiveness of such educational modules for healthcare workers involved in treating patients with COVID-19 to such a degree that the development of such modules was of utmost importance (53). E-module and other educational materials are the cornerstones of medical science development and for updating relevant target populations with the latest medical findings. Even more so for a well-structured e-module developed using the ADDIE method, these modules were found to be most effective in practice and enriching the learners' experience, skills, and knowledge practically and simply (54). Recent studies have pointed out how medical education programs developed using the ADDIE method have been disseminated to improve the knowledge of its learners (54, 55). Furthermore, the validity and

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applicability of this method have been proven effective in other fields of study and contexts (56–60). Hence, our valid e-module can be considered an effective and efficient tool that addresses the lack of educational material regarding COVID-19 medical education for communities.

This study is a formative study using the descriptive analysis method. Online surveys, virtual interviews, and e-mailing the assessment results are widely used as assessment data collection methods (28–30, 61). The quantitative approach allows researchers to send content validity questionnaires to experts working in different locations to be objectively interpreted (62,63). Additionally, evidence-based goal setting will improve learning outcomes, in which SMART goal setting is one of the methods with the most evidence base (64–66). The SMART (specific, measurable, achievable, relevant, and time-bound) method determined the training objectives. Specific means the topic of the e-module is focused only on COVID-19 preparedness for dasa wisma cadres in Jakarta. The training objective is measurable, as the pre-test and post-test results quantify it. The training objective is universally applicable and achievable by dasa wisma with all backgrounds. The topic is highly relevant to the current COVID-19 pandemic in Indonesia, and thus its high importance. The e-module also fulfills the time-bound criteria, as it can be completed quickly (16, 67).

The module was tested by several experts, including policy experts, media and information experts, and scientific experts, to verify the module's logical validity. The module sent via e-mail was analyzed, assessed, and returned to the researcher. This kind of assessment is permissible to be conducted virtually (62, 63). The possibility of biases occurred in some conditions, such as selection bias when selecting the respondents and information bias when the respondents convey the information. The respondents were chosen randomly to avoid selection bias, and participants were limited to respondents with specific inclusion and exclusion criteria. However, due to different barriers, those criteria are not always fulfilled in the true sense. For example, a PCR examination is the only way to confirm the infection in a patient without any symptoms. In addition, someone with COVID-19 symptoms is not necessarily a COVID-19 patient, as another disease can cause those symptoms. Regarding the attempt to limit information bias, the virtual interviewers were trained before beginning the study, the questionnaires were written straightforwardly, and the respondents were not allowed to communicate with each other.

The strength of this study is that three groups of assessors assessed the validity test: enumerators, respondents, and experts. The weakness of the study was the limited number of respondents.

Conclusion

The validity of the COVID-19 preparedness e-module for the dasa wisma cadres, developed using the ADDIE method, has been proven to be strongly valid regarding comprehension, attractiveness, acceptance, involvement, inducement, clarity, sufficiency, coherency, and relevancy.

Ethical considerations

Ethics approval was given by the Research and Community Engagement Ethical Committee, Faculty of Public Health, University of Indonesia. All participants were asked for consent to participate in this study before the study was conducted.

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Disclosure

All authors declare no conflict of interest.
Conflict of interest.

Author contributions

TN conceptualized, prepared the initial study design, and collected and interpreted the data. SR and MKR advised the study's design and analyzed it from an epidemiology point of view. HP advised the formative research design. BS advised the statistical analysis design. RYP, CO, RJ, and KT drafted and edited the manuscript and conducted the literature study. All authors contributed equally to the study.

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Data availability statement

The data in this study was taken primarily from enumerators, respondents, and experts.

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