Journal of Public Health and Pharmacy
2775-4952 (Online - Elektronik)
Research Articles Open Access

Community-Based Tobacco Smoking Cessation Programmes Among Adolescents in Sarawak: Lesson Learned from Process Evaluation

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ARTICLE INFO

Manuscript Received: 26 Apr 2024
Revised: 07 Dec, 2024
Accepted: 10 Jan, 2025
Date of publication: 10 Feb, 2025
Volume: 5
Issue: 1
DOI: 10.56338/jphp.v5i1.5268

KEYWORDS

Process Evaluation;
Tobacco Cessation;
Adolescents
Sarawak

ABSTRACT

Introduction: his study evaluated the effectiveness of community-based quit-smoking interventions using the 5A's and 3A's modules.
Methods: The study was conducted between 2020 and 2021 in Samarahan and Asajaya District, Sarawak, Malaysia. The study included 519 participants out of 600 individuals, and both facilitators and observers evaluated the process. The process evaluation assessed various components: fidelity, dose delivered, dose received, reach, satisfaction, context, justification for intervention withdrawal, facilitator influence on sessions, and intervention feedback.
Results: The study found that most facilitators executed more than 85% of both session modules, achieving at least 75% of the objectives. Most participants of both sessions were positively and actively engaged and would recommend intervention to others. The participants reported positive feedback. However, 26.3% of participants withdrew from the second session due to inconvenient timing. The observer's fidelity evaluations of both intervention sessions were fully implemented according to plans, achieving over 75% of their objectives. Observers acknowledged active and engaged participants during both intervention sessions and regarded all facilitators as appropriate and positive toward participants. The process evaluation showed that the interventions were administered well, and smoking adolescents demonstrated a willingness to quit smoking due to the outcomes of this intervention.
Conclusion: The study's findings offer important insights and novel aspects about how effective community-based interventions are for smoking cessation and emphasize the necessity of assessing intervention processes to understand their connection with outcomes. The results of this study could guide the creation and execution of future interventions aimed at decreasing smoking rates among adolescents.

Publisher: Pusat Pengembangan Teknologi Informasi dan Jurnal Universitas Muhammadiyah Palu

INTRODUCTION

Smoking is a significant public health issue globally, with estimated one billion people smoking tobacco, accounting for one-fifth of the world's population (1-4). Smoking-related illnesses significantly increase morbidity and mortality rates, making tobacco a critical public health concern (5). In Malaysia, smoking is the leading preventable cause of premature death, with almost 20,000 deaths attributed to smoking. Smoking-related morbidity and mortality rates have stagnated due to high smoking rates among male adults and teenagers aged 13 to 15 (6). The prevalence of smoking among adolescents in other South-east Asian countries, such as Indonesia, Bhutan, Thailand, the Philippines, and Vietnam, is also a concern. The Global Youth Tobacco Survey (GYTS) reported high smoking prevalence rates among adolescents in Indonesia and Timor Leste (7-8). Despite alarming prevalence rates, there have been significant declines in smoking prevalence among adolescents, including a remarkable decline of 18.2% in the proportion of active cigarette smokers among adolescents in 2009 (9). Tobacco control measures are necessary to reduce smoking prevalence and improve public health outcomes.

Smoking cessation programmes can be population-based or individual-based, with the 5As and 3As intervention models being common approaches (10-12). Programme evaluation is a critical component in determining the success of any program in achieving its objectives. Process evaluation is a comprehensive technique that attributes outcomes to intervention, not extraneous environmental variables (13-14). It effectively determines whether a specific intervention is implemented as intended and clarifies the relationship between intervention activities and outcomes (4). In community-based quit-smoking interventions, a process evaluation of 5A's and 3A's is essential. It is crucial to describe the methodologies and findings of such an evaluation to provide valuable insights into the effectiveness of these interventions and help improve future implementation strategies (15). The 5A's approach includes five steps: Ask, Advise, Assess, Assist, and Arrange, while the 3A's approach consists of three steps: Ask, Advise, and Refer (16). Both approaches aim to assist individuals in quitting smoking by providing them with the necessary support and resources. However, it is important to evaluate the effectiveness of these interventions to determine which approach is more effective in achieving the desired outcomes (4).

Process evaluation is crucial for assessing the effectiveness of community-based smoking cessation interventions, such as the 5A's and 3A's models. This comprehensive approach involves analysing intervention activities, their implementation, and reception by the target population, and evaluating the achievement of objectives like successful quit rates. By examining challenges and barriers faced during implementation and identifying potential solutions, process evaluation contributes to improving future interventions' effectiveness. This study offers a unique perspective on the process evaluation of community-based tobacco smoking cessation programmes among adolescents in Sarawak, Malaysia, providing valuable insights into the implementation and effectiveness of the 5A's and 3A's intervention models within a specific cultural context. The research's focus on lessons learned contributes novel information to the existing literature on smoking cessation interventions for Southeast Asian adolescents, potentially informing future program designs and implementation strategies in similar settings. Ultimately, this thorough evaluation approach can lead to more effective interventions, helping to reduce smoking prevalence and improve overall population health.

METHOD

The setting, population, and sampling

This study used a three-arm parallel cluster randomised controlled trial to evaluate 5A and 3A smoking cessation interventions for adolescent smokers in rural Sarawak. A total of 519 participants aged 13-17 were recruited from six villages, with each group consisting of 175 participants based on sample size calculations. The study included 99 rural communities, but only 29 villages met the inclusion criteria. The calculation did not involve correction for clustering, assuming a negligible design effect (17-18).

Interventions and follow-up

The 3A and 5A brief smoking cessation interventions differ in terms of time and the strategies used to assist smokers in quitting. The 3A intervention involves asking about tobacco use, providing advice to quit, and helping patients create a quit plan. On the other hand, the 5A intervention involves asking about tobacco use, providing advice, assessing the subject's willingness to quit, assisting with quitting using counselling and pharmacotherapy and arranging follow-up contacts. In this study, student smokers received either the 3A or 5A intervention during the first

village visit, followed by surveys and carbon monoxide testing during baseline, six, and nine months. Follow-up interventions were conducted during the sixth month (19-20).

Process evaluation

Process evaluation is an essential tool used to assess if an intervention was implemented according to plan and can help in understanding the relationship between the intervention activities and outcomes (13). It is crucial to understand contextual factors that may impact intervention implementation and consider whether the intervention can be transferred to other contexts (20). Prior to the intervention program, facilitators were given an Observation Form A questionnaire, and observers were given an Observation Form B questionnaire. This process evaluation was adapted from a study by Bteddini et al. (13). The logic model framework was used as a reference for planning, implementing, monitoring, and evaluating the intervention (21). The study was divided into five components: problem, input, activities, outputs, and outcomes (22). The problem statements were based on a situational analysis of the literature. After completing the situational analysis, the researcher planned input by meeting with the stakeholders of the villages (heads of the villages). The input referred to the necessary resources needed to implement the health program, which included manpower, materials (quit smoking module and pCO Smokerlyzer), and funds received from the grant. The activities of this research were quit-smoking interventions using the 5A's and 3A's modules (Figure 1).

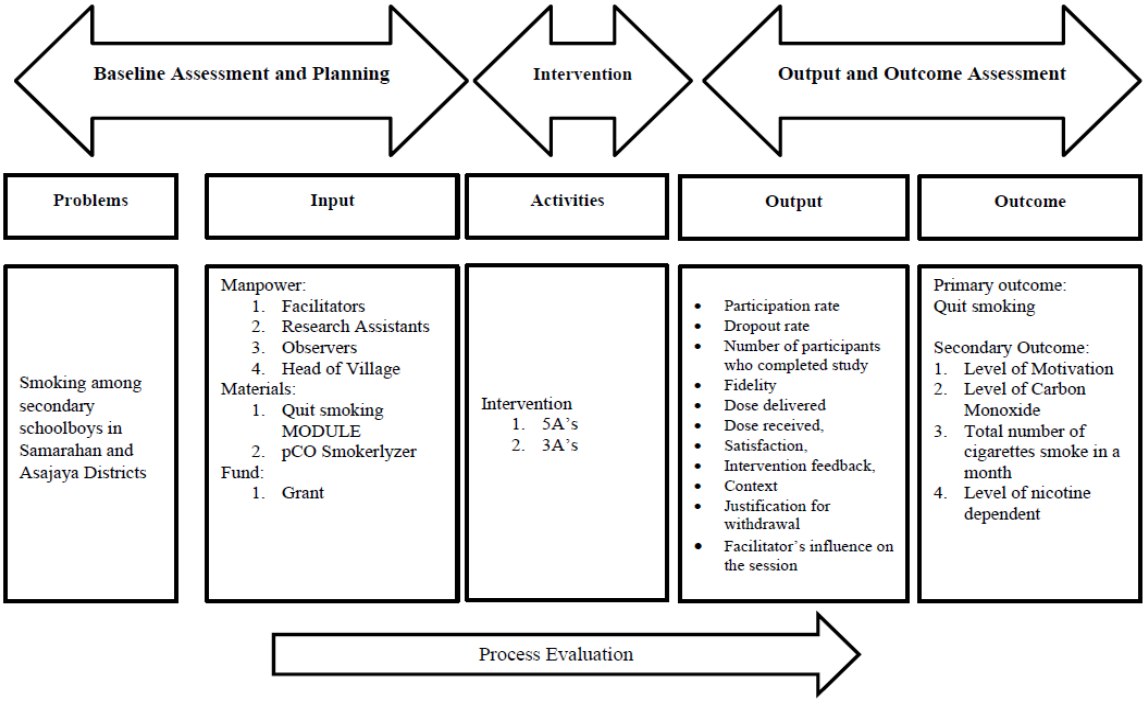

Figure 1. Logic Model of Quit-Smoking Intervention

The output refers to tangible products, capacities, or achievements resulting from the implemented activities (23). The outputs included participation rate, dropout rate, number of participants who completed the study fidelity, dose delivered, dose received, satisfaction, intervention feedback, context, justification for withdrawal, and facilitator's influence on the session. The outcomes were classified into primary outcomes achieved with smokers quitting smoking and validated using pCO smokerlyzer. The secondary outcomes were the level of motivation, level of carbon monoxide, the total number of cigarettes smoked in a month, and level of nicotine dependence. Facilitators evaluated the intervention process based on eight components using Observation Form A, while observers evaluated the process based on four components using Observation Form B. Eight components include participants' reach, fidelity, dose delivered, dose received, satisfaction, intervention feedback, context, and justification for withdrawal.

The four components include fidelity, dose delivered, dose received, and facilitator's influence on the session. At least 10% of the first and second intervention sessions were observed by the observers (12-13).

Data collection instruments

Our study used two assessment tools viz form A and form B. The tools were pretested and adjusted accordingly. The facilitators filled Form A with eight components: fidelity, dose delivered, dose received, satisfaction, intervention feedback, context, reach, and justification for withdrawal (12-13). The observers filled Form B with four components: fidelity, dose delivered, dose received, and facilitator's influence on the session (13).

Measurement of process evaluation

Fidelity may be defined as how the delivery of an intervention adheres to the protocol or program model originally developed (24). The fidelity component was evaluated using a questionnaire that analysed how the intervention was implemented according to 5A's and 3A's intervention modules. Supposedly the facilitators would start the module with 'Ask'; however, if the facilitators started at the second component of the module, for example, for 3A's is 'Advise,' the facilitators considered as 'Implemented in a manner inconsistent with the initial plans in the manual.'

Dose delivered can be defined as the 'number or amount of intended units of each intervention or each component delivered or provided' (25). The dose-delivered component was assessed using a questionnaire that analysed whether or not the objectives were implemented as planned. To determine the dose delivered, the facilitators and the observers must calculate according to the total of A's component in each participant's 5A's or 3A's intervention module. For example, if the facilitators only managed to give 2A's out of 3A's component in the 3A's intervention group, the dose delivered would be 66.7%. Similarly, among the 5A's intervention group, if the facilitators managed to give 4A's out of 5A's component, the dose delivered would be 80%.

The dose received can be defined as 'the extent to which participants actively engage, interact with, are receptive to, and or use materials or recommended resources' (25). The dose received also is evaluated by the facilitators and the observers. The dose received component was evaluated using a questionnaire that analyses the extent to which participants' active engagement with, interaction with, and receptiveness to recommended resources. To determine the dose received among participants in this intervention, we divided it into four responses based on their engagement and interaction with the facilitators during the intervention session.

Satisfaction can be defined as 'participant satisfaction with the programme, interactions with facilitators and or investigators' (14). The satisfaction component was evaluated using two Likert scale questions based on the support received for quitting smoking and whether the participants wanted to recommend this intervention to other smokers. The facilitators asked these two questions to the participants after the intervention session.

Intervention feedback is about the participant's satisfaction with the intervention and perceived dose received (13). The intervention feedback component was evaluated on intervention content, intervention delivery, the significance of the program, and suggestions questions asked by the facilitators to the participants after the intervention session.

Context includes 'aspects of the physical, social, and political environment and how they impact implementation' (14). To ensure the intervention programmes went smoothly, consent from the head of the villages and the family members of the participants must be obtained. This is very important to avoid conflict during the intervention session. This context evaluation is also important for the researcher to see whether the head of the villages and the participant's family members support this quit-smoking intervention in their village.

The Reach part analyses the number of participants reached, parents or guardians who consented, parents or guardians who refused consent, and consented participants who withdrew from this intervention. This can be identified from the consent form given to the family members of the participants before the intervention. This is to ensure sufficient numbers of the target population are being reached for this study. This also shows the support of the participant's parents or guardians in helping them quit smoking (13).

Justification for intervention withdrawal analysed the justification from the participants withdrawing from intervention. This was done by asking the participants who didn't turn up during the sixth-month intervention follow-up from the baseline. This part will help improve future studies by understanding the participants' reasoning for withdrawing from the study to reduce the dropout among the participants (17, 26).

Facilitator's influence on the session helps to analyse the extent to which the facilitator's influence during the intervention session. Observers will observe the facilitators during the intervention session to see the facilitator's influence towards the participants, whether it is appropriate or inappropriate regarding communication and response (13).

Data entry and analysis

All facilitator and observers completed their forms on the same day. The project coordinator reviewed them for accuracy and followed up on missing data. Data entry and analysis were via SPSS 28 for Windows (27). Descriptive statistics were presented in percentage, mean and standard deviation.

Ethical Approval

The ethics committee has approved the research conducted by the faculty. The faculty is committed to upholding ethical standards in all research endeavours and takes great care to ensure that all parties involved know the nature of the research and their role in it. To ensure transparency and ethical practices, all parents or guardians of the participants were required to sign informed consent forms. Additionally, all participants were briefed on the research and voluntarily agreed to participate. To further ensure the ethical collection of data, district offices and local councils in the respective localities where the research was conducted gave their approval. This ensured that all data was collected in a manner that was respectful and considerate of the communities involved.

RESULTS

Participants

Although 764 individuals were reached for this quit-smoking intervention study, only 600 (78.5%) of their parents or guardians consented. Additionally, 164 (21.5%) of the reached individuals declined to participate in the study because their parents or guardians did not agree. Additionally, 81 (13.5%) out of 600 individuals with consent withdrew from this study because of age matching. The final participants for this study were 519 (86.5%) from 600 participants with consent (**Figure 2**).

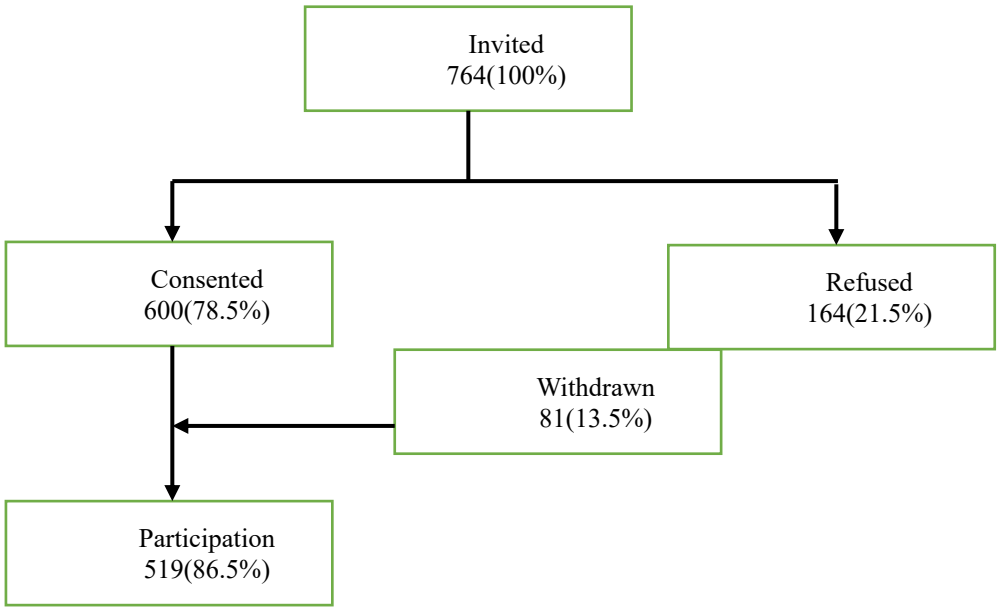

Figure 2 Schematic diagram of study participants

Evaluation made by the facilitator

Table 1 illustrates the facilitators' evaluation of the intervention given to participants regarding fidelity, dose delivered, dose received, satisfaction, intervention feedback, context and justification for withdrawal from the study. Most facilitators executed the modules effectively, with the first intervention totalling 296 (85.5%) and the second totalling 231 (90.6%). Facilitators reported that 323 (93.4%) of the first intervention sessions and 246 (96.5%) of the second intervention sessions achieved over 75% of the objectives. In the first intervention session, facilitators assessed participant involvement as 'positive and active' in 268 sessions (77.5%) and 206 (80.8%). Two questions gauged participant satisfaction. With a mean of 4.80 (0.524) from the first intervention session, 295 participants (85.3%) were very satisfied with the quit-smoking intervention. In the second intervention session, 232 (91.0%) participants were very satisfied, with a mean of 4.90. (0.340). The second question revealed that most participants were likely to suggest this intervention to other smokers, with 298 (86.1%) recommending the first session and 233 (91.4%) recommending the second session. During the first session, 346 (98.7%) and 255 (98.4%) participants were educated on the constituents included in cigarettes. They learned about the harmful effects of smoking and how to avoid peer pressure. The facilitators were professional, friendly, and engaged. Participants indicated that intervention sessions would benefit adolescents aged 13 and that incorporating the intervention into educational curricula would be ideal. The most common reason for withdrawal from the second session was inconvenient timing (n=65, 71.4%), followed by disinterest in the intervention (n=24, 26.3%) and intervention ineffectiveness (n=2, 2.2%).

Table 1. Facilitator's evaluation

Parameters	Session 1 (n=346)		Session 2 (n=255)	
	Number	%	Number	%
Fidelity: Fully implemented	296	85.5	231	90.6
Dose Delivered: >75%	323	93.4	246	96.5
Dose Received: fully engaged	268	77.5	206	80.8
Satisfaction				
Fully satisfied	295	85.3	232	91.0
Recommended to others	298	86.1	233	91.4
Feedback: Positive feedback	346	98.7	255	98.4
Context: Approval from parents and village headman	346	100.0	255	100.0
Justification of withdrawal*	-	-	-	26.3

Out of 346 participants, 91withdraw

Evaluation made by the observer

The observer evaluated the intervention given by facilitators to participants, which was measured in terms of fidelity, dose delivered, dose received, and facilitator's influence (**Table 2**). Observer fidelity evaluations showed that 35 (87.5%) and 24 (92.3%) of the first and second interventions were completely executed. Regarding the observer's dose-delivered evaluations, 37 (92.5%) sessions achieved above 75% of the objectives for the first intervention and 24 (92.3%) for the second intervention. Observers evaluated participant engagement as highly 'positive and active' in 33 (82.5%) of the first session and 22 (84.6%) of the second session participants. Observers reported 38 (95.0%) and 24 (92.3%) of the first and second intervention session facilitators were suitable and positive toward the participants. Observers also observed that 2 (5.0%) and 2 (7.7%) of the first and second intervention session facilitators were neutral towards the participants.

Table 2. Observer's evaluation

Parameters	Session 1 (n=40)		Session 2 (n=26)	
	Number	%	Number	%
Fidelity: Fully implemented	35	87.5	24	92.3
Dose Delivered: >75%	37	92.5	24	92.3
Dose Received: fully engaged	33	82.5	22	84.6
Facilitator's positive influence	38	95.0	24	92.3

DISCUSSION

Process evaluation is critical for increasing the validity of intervention effect pathways by determining specific components associated with success, offering feedback on the intervention's quality, identifying intervention strengths and shortcomings, and documenting implementation (13, 28). Our study illustrates the process evaluation of 5A's and 3A's quit smoking interventions among secondary school students in the Samarahan division, Sarawak. This was the first quit-smoking intervention to report process evaluation utilising the 5As and 3As. Thus, process evaluation should occur before effectiveness evaluation, as it paves the way for more in-depth knowledge of the impactful pathways (20). This process evaluation's findings, with the high consent rate and willingness to participate in the study, suggest that participants' parents were mostly aware of the research significance and harmful effects of adolescent smoking. It also pointed to the need for a high-fidelity intervention by facilitators and observers, comparable to the study by Bteddini et al. (13). High fidelity indicates that the interventions were administered following the module's 5A's and 3A's interventions (29). Regarding the dose delivered, the facilitators and observers agreed that more than 75% of the intervention objectives were implemented, and a higher dose delivered during the intervention was crucial to attaining a higher smoking cessation rate (30-31). Regarding the dose received, most participants were positive, active, and motivated to learn and apply the facilitators' advice about smoking cessation (32). The participants of 5A's and 3A's quit smoking interventions were highly satisfied. Simultaneously, they were likely to spread awareness about the interventions to their friends. Smokers who respected and trusted physicians would expect to be treated for tobacco addiction. They are also more comfortable discussing cessation with doctors, boosting their chances of stopping (33-34).

Regarding intervention feedback, facilitators educated most participants regarding the constituents of cigarettes, the numerous health impacts and illnesses associated with tobacco misuse, and strategies for resisting peer pressure (10, 35-36). This information is critical because individuals who lacked a basic understanding of cigarettes and were subjected to peer pressure were more likely to smoke (37-38). Most participants mentioned that the facilitators were professional, approachable, engaged, and active throughout the sessions. Observers agreed that facilitators behaved responsibly and pleasantly toward participants. Participants were more receptive to coaching assistance and advice for smoking cessation when they evaluated the coach as compassionate, professional, and non-judgmental (39). Concerning the program's significance, participants agreed it should be introduced to adolescents under 13, as some individuals began smoking as young as ten. In contrast, the study's participants began smoking at twelve (40). Several participants suggested pushing intervention boundaries to include other relevant issues, such as drugs and alcohol awareness, as smokers often engage in this type of high-risk behaviour (41). In addition, other participants suggested increasing the number and frequency of sessions to boost their success rate in quitting smoking (42), recommending that the program be permanently integrated into the school curriculum to allow for more delivery flexibility (13).

In terms of context, it can be observed that village heads or family members consented to interventions to be conducted in their communities. This is an important step to prevent any interference during the intervention as it involves school-age children considered minors in the community. More importantly, this result has two perspectives: village heads being aware of research significance and facilitators' confidence in delivering the intervention programme. Village heads are best positioned to understand the ongoing issues among adolescents in their communities. The social environment may impact smokers' desire to quit behaviours (43-44). For instance, this might motivate smokers to accept responsibility for their actions and behaviours, assisting them in quitting (45-46).

The challenge of attrition in smoking cessation programmes is a multifaceted issue affected by numerous elements (47). The programme identified that certain individuals dropped out because the timing was inconvenient. This challenge would assist future researchers in designing quit-smoking programmes with more adaptable scheduling rather than maintaining inflexible timetables. Methods to enhance retention encompass organizing interventions in community environments, employing trained peer motivators, and customizing programmes for particular groups (48). Tackling participants' concerns, offering assistance for managing withdrawal symptoms, and including facilitators like oral stimulation and community support could help decrease attrition rates.

The evaluation mentioned in the text has a significant drawback that needs to be addressed. The observers only observed 10% of the facilitators' sessions, meaning the findings may not be reliable. This limitation can lead to considerable bias and affect the accuracy of the results. To overcome this issue, it is essential to conduct further research that can provide a more comprehensive understanding of the participants' perspectives. Qualitative research

could effectively assess participant satisfaction as it allows for an in-depth exploration of their experiences and opinions. Qualitative research involves collecting data through open-ended questions, interviews, and observations. This type of research can provide valuable insights into the participants' thoughts, feelings, and behaviours, which can help identify areas for improvement and inform future interventions.

Limitation and Implication

The evaluation mentioned in the text has a significant drawback that needs to be addressed. The observers only observed 10% of the facilitators' sessions, meaning the findings may not be reliable. This limitation can lead to considerable bias and affect the accuracy of the results. To overcome this issue, it is essential to conduct further research that can provide a more comprehensive understanding of the participants' perspectives. Qualitative research could effectively assess participant satisfaction as it allows for an in-depth exploration of their experiences and opinions. Qualitative research involves collecting data through open-ended questions, interviews, and observations. Community-Based Tobacco Smoking Cessation Programmes Among Adolescents in Sarawak: Lesson Learned from Process Evaluation This type of research can provide valuable insights into the participants' thoughts, feelings, and behaviours, which can help identify areas for improvement and inform future interventions.

CONCLUSION

In conclusion, effective program management requires a thorough process evaluation. Rigorous process evaluation ensures that programs achieve their intended impact and deliver value to stakeholders. Stakeholders are vested in determining whether a programme meets its objectives and positively impacts the intended beneficiaries. In the case of a smoking cessation program, participants' feedback is crucial to assessing the program's success. Fortunately, in this instance, participants reported that the treatments were well-administered, and they expressed a willingness to quit smoking permanently due to the programme's outcomes. Such feedback is encouraging and demonstrates the value of investing in evidence-based interventions. With continued evaluation and refinement, smoking cessation programs can make a meaningful difference in the lives of individuals and communities.

AUTHOR'S CONTRIBUTION STATEMENT

The study design was developed by a team comprising Rahman MM, Siddiq M, Lukas SB, and Kana BK. Siddiq M, Ajeng RN, and Gahamat MF conducted the data-gathering process. The manuscript was written and submitted by Rahman MM and Siddiq M. The final draft of the manuscript was edited and approved by all authors.

CONFLICTS OF INTEREST

All authors declare that there is no competing interest associated with this research.

SOURCE OF FUNDING STATEMENTS

UNIMAS Joint Fund (Project ID: F05/CDRG/1822/2019). The funding agency had no role in the study's design, data collection, analysis, interpretation, and manuscript preparation.

ACKNOWLEDGMENTS

The study was approved by the UNIMAS Ethics Committee (Ref # UNIMAS/NC-21.02/03-02 Jld.4 (51), 22 January 2020) and registered with the ISRCTN registry (Reg. #: ISRCTN 12273006). The authors are grateful to the local district offices and councils for their support and funding provided by UNIMAS Joint Fund (Project ID: F05/CDRG/1822/2019).

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