

DEVELOPMENT AND VALIDATION OF TUBERCULOSIS EDUCATION MODULE FOR TB HEALTH YOUTH AMBASSADOR PROGRAM IN GROBOGAN DISTRICT: A PRECEDE-PROCEED BASED DEVELOPMENT STUDY

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ABSTRACT

Background: Tuberculosis (TB) remains a significant public health concern in Indonesia, especially in rural areas with high disease burden and low levels of public awareness. Adolescents are often overlooked in TB education efforts, despite their potential as community-based health promoters. Objectives: This study aims to describe the development and validation process of an educational module for the Tuberculosis Youth Health Ambassador (THYA) program in Grobogan District, Central Java. Methods: A modified research and Development (R&D) design based on the PRECEDE –PROCEED Model was employed. The study included a situational assessment using in-depth interviews and focus group discussions (FGDs) with adolescents, healthcare workers, and community stakeholders, followed by the development of an educational module. The module was validated through expert judgment and small group trials with adolescent users. Qualitative data were analyzed thematically, while quantitative data were analyzed descriptively. Results: The situational analysis revealed that adolescents had baseline TB knowledge but limited understanding of latent TB and early detection of the disease. The developed module covers TB transmission, treatment, stigma reduction, and peer communication strategies. Expert validation yielded a content feasibility score of 88 % (Very good), and adolescent feedback indicated high practicality, clarity, and relevance. Conclusion: the THYA educational module is a feasible and context-appropriate tool for future training of youth health ambassadors in TB awareness. Its participatory design and validation suggest strong potential for replication and integration into youth health promotion strategies. Field implementation is recommended to evaluate the module's effectiveness in improving TB related knowledge and behaviors among adolescents.

Keywords: adolescent health promotion, health literacy, participatory module, tuberculosis

INTRODUCTION

Tuberculosis (TB) remains a complex and ongoing global public health problem. The World Health Organization (WHO) reports that Indonesia ranks second as the country with the highest TB burden in the world, after India Click or tap here to enter text. At the national level, the challenge of TB control lies not only in the capacity of health services, but also in low levels of public awareness, social stigma, and delays in seeking treatment. Central Java is one of the regions with a high incidence of TB, with 87,074 TB cases found [2]. Community-based promotive and preventive efforts are key in accelerating TB elimination, especially in areas with limited resources and access to health services.

Adolescents are an age group that has not been the main focus of TB risk communication and education strategies, even though they have great potential as agents of change in the community. As an adaptive and socially active group, adolescents are able to serve as a bridge of information between health facilities and communities. Strategies that focus on improving health literacy and empowering individuals, particularly adolescents, have shown potential in supporting community-based TB control programs. Grobogan district is one of the areas with a high incidence of TB, but has case finding achievements that are still far from the target. The initial situational assessment showed that adolescents' knowledge and attitudes towards TB are limited, and their involvement in public health programs is minimal. On the other hand, there is great potential for adolescents to be actively involved as educators in community-based TB campaigns. In response to these conditions, a *Tuberculosis Youth Health Ambassador* (THYA) intervention model was developed that aims to empower adolescents as health ambassadors in raising TB awareness in Grobogan District. The model adopts the PRECEDE-PROCEED approach that has been proven effective in community-based health promotion. This model emphasizes the importance of mapping predisposing factors (knowledge, attitudes), enabling factors (access to information, training), and reinforcing factors (social and institutional support) in planning and implementing health interventions [3]. In this context, THYA do not only function as educational targets, but as active subjects who help design and deliver health messages to fellow adolescents and the wider community.

Scientific documentation of field practices that systematically involve adolescents in TB health promotion at the local level is limited, especially in Indonesia. The literature on adolescent-based interventions has yet to address the role of adolescents in other infectious disease issues such as TB. Therefore, this report was prepared as a form of documentation and

evaluation of the implementation of the THYA program, with the hope that it can become a reference for *best practices* and models that can be replicated in other areas with similar characteristics. The purpose of this article is to systematically describe the process of developing and validating the THYA education module in Grobogan District as the initial stage of an adolescent empowerment intervention in TB health promotion.

METHODS

The *Tuberculosis Youth Health Ambassador (THYA)* program was developed and implemented using a modified *research and development (R&D)* approach, which can be used to produce and test the effectiveness of specific products, such as models, patterns, procedures, books, modules, or programs. By referring to the PRECEDE-PROCEED Model (PPM) framework as the basis for planning health promotion interventions. This model was chosen because of its ability to systematically identify behavioral and environmental determinants, and to develop interventions that are contextual and based on local needs. The program was implemented in Grobogan District, Central Java Province, an area with a high TB burden and low adolescent involvement in health promotion. The targets of the adolescent health ambassador program for TB are adolescents aged 18-22 years from health students living in Grobogan District.

The program development process that is written in this manuscript particularly: situation assessment and the module development, The first stage was a situation assessment, conducted through in-depth interviews and focus group discussions (FGDs) with various parties, including adolescents, health workers, TB programmers, stakeholders from the health office, puskesmas heads, cadres, and community representatives. This stage aimed to identify predisposing, enabling, and reinforcing factors that influence TB awareness in Grobogan District. The results of this assessment were used as the basis for the second stage, which was the development of the content of the THYA education module, which included material on TB, health communication, the role of youth ambassadors, and strategies to overcome stigma in the community. The module was developed in a participatory manner, then validated by health promotion experts, pulmonary specialists, and practitioners to ensure suitability of content, language, visual appeal and accuracy of delivery methods. The third stage is the training of youth ambassadors, which will be carried out in the form of interactive workshops using an active *learning* approach (*participatory learning*), with an emphasis on increasing participants' knowledge, communication skills, and self-efficacy.

The validation of module focuses on testing the *content validity* and practicality of the module by prospective users. Data collection instruments included validation observation sheets, open interview guides, and module assessment questionnaires. Module content validation used expert judgment technique and limited practicality test (*small group try out*). Qualitative data were analyzed using the *thematic content analysis* method to identify key themes relevant to the educational needs of adolescents and society, while quantitative data from the feasibility assessment and participant feedback were analyzed descriptively using average scores and category distribution. A source and method triangulation approach was used to increase the credibility and validity of the data.

RESULTS

1. Situational assesment

Most adolescents in Grobogan District have a good basic knowledge of TB. They generally recognize the common symptoms of TB and understand the importance of complete treatment, although understanding of the difference between active and latent TB and the urgency of early detection still needs to be strengthened. This information was an important input in formulating the structure and content of the THYA education module to suit the needs and literacy levels of local adolescents.

These initial findings provide a strong basis that adolescents have functional literacy potential that can be further developed through structured training. Adolescents are a strategic group that can be empowered as health promotion agents. This is in line with the concept of health literacy, which emphasizes that literacy is not only related to knowledge, but also includes skills in accessing, understanding, and using health information effectively [4]. The THYA module was developed to strengthen this literacy, with the hope of encouraging broader healthy behavior changes after the implementation of the training phase.

2. Active Role of Youth in Health Promotion

The program repositioned adolescents from information recipients to active actors in community-based health promotion. The adolescent health ambassadors for TB are not only involved in training, but also participate in designing, organizing, and delivering TB awareness campaigns in the community. The situation assessment process showed that adolescents had high enthusiasm, early awareness of TB issues, and interest in engaging in educational

activities in their neighborhoods. This process demonstrated that meaningful participation of adolescents can be achieved through appropriate empowerment approaches, and is a potential strategy to sustainably expand the reach of health promotion and reduce TB stigma at the community level [5].

3. Module development

The development of the THYA module was carried out through a systematic process that combined evidence-based content, adolescent perspectives, and expert input. The structure of the module was designed to address the knowledge gaps identified in the situational assessment, particularly in differentiating between active and latent TB, the urgency of early detection, and the importance of adherence to treatment. The material was arranged in a stepwise manner, starting from basic concepts of TB to more advanced topics such as stigma reduction and communication strategies. To ensure relevance and accessibility, the language and illustrations were adapted to the literacy levels of adolescents, and interactive elements such as group discussions, role plays, and storytelling were embedded into the training activities. This approach emphasized not only the transfer of knowledge, but also the development of communication and leadership skills necessary for adolescents to act as effective health ambassadors. In this way, the module became both an educational resource and a practical guide to empower adolescents in promoting TB awareness within their communities [6].

4. Content Validity and Practicality of THYA Module

The training module developed in this program has gone through a validation process by a health promotion expert and a TB specialist, as well as functional testing by potential users (adolescents and communities). The validation results showed an average score of 88%, which was categorized as "very good" in terms of content, presentation, language, and illustrations. The module was considered easy to understand, visually appealing, and able to facilitate understanding of TB concepts with an adolescent experience-based approach. In addition, the module is equipped with practical tools such as communication simulations, case studies, and individual reflections that stimulate participants' critical thinking.

5. Social Resonance and Primary Health Care Support

Stakeholders at the primary health care and community levels responded positively to the THYA program by developing a THYA education module. The Puskesmas welcomed the

involvement of adolescents as strategic partners in TB education as an innovative and potential approach to expand the reach of health messages, starting with the existence of a TB module that will facilitate the THYA training process in the future. Meanwhile, the community, especially parents and community leaders, appreciated the involvement, enthusiasm and courage of adolescents in delivering TB information that was previously considered sensitive and embarrassing. This reflects a shift in social attitudes towards TB, as well as the potential of adolescents as catalysts for changes in community attitudes .

6. Program Initial Development Results

During the implementation period, the THYA program has successfully formulated a tuberculosis education module specifically designed for adolescent health ambassadors for TB and for communities with a visual, participatory, and activity-based approach. The module has been validated by experts in health promotion and infectious diseases with the result that the feasibility score is in the excellent category. In addition, potential users from among adolescents were involved in the practicality assessment, which showed that the module was easy to understand, interesting, and suitable for their needs. This achievement is an important basis for the implementation of the next stage, which is the piloting of the module in training and field education. Although not yet widely implemented, these validation results reinforce the potential use of the module in *peer education* strategies to increase TB literacy and awareness among adolescents. These data reinforce previous findings that *peer education* approaches are effective in increasing community participation in health programs.

DISCUSSION

1. Impact on Adolescent Health Literacy

The results of the initial situation assessment in the process of developing the *Tuberculosis Youth Health Ambassador (THYA)* program showed that most of the prospective youth ambassadors had a fairly good level of knowledge about tuberculosis. They were able to explain in general terms the symptoms, modes of transmission, and the importance of TB treatment. This finding indicates the potential for functional literacy that can be further developed through structured training. Although formal training has not been implemented at this stage, the assessment results provide a strong basis that adolescents are a strategic group that can be empowered as health promotion agents. This is in line with the concept of health literacy according to , which includes the ability to understand and use health information in

daily life. This information is an important foundation in developing educational modules that suit the needs and characteristics of adolescents in Grobogan District.

2. Youth Empowerment as Agents of Change

In the development phase of the THYA program, initial studies showed that adolescents have great potential to be empowered as agents of change in health promotion, especially related to TB awareness. One of the main strengths of the THYA program is the transformation of the role of adolescents from objects of intervention to subjects who actively contribute. assessment results show that adolescents have motivation, concern, and basic communication skills that are promising to be further developed through appropriate training. These findings reinforce the urgency of developing an educational module that not only provides knowledge about TB, but also develops advocacy skills and participatory health messaging, enabling adolescents to mobilize communities, organize outreach activities, and manage discussions about TB in a participatory manner. This finding supports the principle of *youth-led health promotion*, where direct involvement of adolescents in program design and implementation produces stronger effects than top-down approaches . In addition, involving adolescents in TB health promotion has been shown to lower intergenerational communication barriers and reduce the stigma that often hinders early detection [7]. This is in line with the results of which showed that youth ambassadors are effective in bridging health information due to their age, language, and cultural affinity with the target[8].

3. Supporting and inhibiting factors

The process of developing the *Tuberculosis Youth Health Ambassador (THYA)* education module showed supporting factors that can strengthen the implementation of the program at a later stage. One of the main factors was the initial support from the health office, puskesmas and TB cadres in the field who welcomed the plan to involve adolescents as health promotion partners. In addition, adolescents' openness in group discussions and exploratory interviews indicated motivation and readiness to play an active role, which became an important basis for designing contextualized and participatory learning content. The developed modules have been specifically designed not only to deliver educational information, but also to build adolescents' skills in interpersonal communication, problem solving, and community-based health advocacy .

However, the development process also identified a number of potential barriers that need to be anticipated in the upcoming implementation phase. These include the variation in literacy levels among potential participants, the limited training time available in the academic calendar, and the need for visual aids that suit the learning characteristics of adolescents. In addition, some informants said that not all community environments are ready to accept adolescents as health messengers, especially on the issue of TB, which is still surrounded by social stigma. Therefore, strengthening strategies through the involvement of community leaders and alignment with academic programs or puskesmas are important to ensure the effectiveness and acceptance of the program when implemented in the field [9].

4. Replication Value and Sustainability Potential

Although the *Tuberculosis Youth Health Ambassador (THYA)* program is still at the educational module development stage and has not yet reached the training or implementation phase, the program design shows high potential to be replicated and adapted in various regions with similar TB burden. The flexible module structure, participatory approach, and integration of youth empowerment values make THYA a promotive intervention that is adaptive to the local context. WHO has recommended a *community-based youth engagement* approach as one of the innovative strategies for TB elimination in developing countries, and the THYA development initiative in Grobogan systematically fulfills these principles.

The potential sustainability of the program lies in the module's ability to be integrated into the formal education system, such as extracurricular activities or local content curriculum. In addition, the possibility of establishing a cross-school or cross-village youth ambassador network can support the exchange of experiences and expand the reach of education. Digitalization of training materials and development of technology-based monitoring platforms are also important opportunities to ensure that program implementation can adapt to the dynamics of the times, including post-pandemic mobility limitations. Policy support from local stakeholders and integration of this program into the national health promotion agenda will be key to maintaining the sustainability and long-term impact of this initiative [10].

CONCLUSIONS AND RECOMMENDATIONS

The *Tuberculosis Youth Health Ambassador (THYA)* education module has been successfully developed and validated with excellent results from the aspects of content, presentation, and language. The module was designed in a participatory manner by considering

the needs of adolescents, the local context, and the principles of community-based health promotion. Expert validation results indicate that the module is suitable for use as teaching material in the training of adolescent health ambassadors for TB, and has the potential to be an effective educational medium in efforts to improve health literacy and reduce TB stigma among young people. Although training and field implementation are yet to be conducted, the development of this module has established a strong foundation for the next phase of piloting.

A field trial is needed to assess the effectiveness of the module in improving adolescents' knowledge, attitudes, and communication skills related to TB. The results of the implementation phase will be a key indicator in determining the extent to which this module is able to encourage real health behavior change in the community. Therefore, support from universities, health centers, and communities is needed to integrate this program into the adolescent health education system, either through extracurricular activities or local content curriculum. In the medium to long term, this module has the potential to be replicated in other regions with similar demographic and epidemiological characteristics. Collaboration between local governments, educational institutions, health workers, and youth organizations is key in expanding the reach of the program. As a form of policy strengthening, it is recommended that policy makers consider involving adolescents more strategically in TB control programs. This includes the development of national standards-based training guidelines, budgetary support for youth education programs, and engagement across sectors to build a collaborative ecosystem that supports sustainability. In the context of TB elimination 2030, adolescents not only serve as a target population, but also as transformational partners who contribute to accelerating the achievement of national health targets [11].

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