Smartphone-Based Health Education To Improve Knowledge And Attitudes In Filariasis Prevention

ABSTRACT

Aims: This study aimed to assess the effectiveness of a smartphone-based health education application, *Edu Fila*, in improving community knowledge and attitudes toward filariasis prevention in an endemic area.
Methods: A pre-experimental, one-group pretest–posttest design was used, involving 50 purposively selected participants from Muaro Jambi District, Indonesia. Participants received three educational sessions via the Edu Fila mobile application, covering key aspects of filariasis including transmission, symptoms, impact, and prevention. Knowledge and attitudes were measured before and after the intervention using validated questionnaires. Paired *t*-tests were applied to analyze the statistical significance of changes.
Fundings: The results showed a significant increase in both knowledge and attitude scores following the intervention. The mean knowledge score improved from 40.38 to 53.62 ($p = 0.000$), and the mean attitude score increased from 32.92 to 40.52 ($p = 0.000$). These findings indicate that the smartphone-based education model was effective in enhancing participants' understanding and attitudes related to filariasis prevention.
Conclusion: The Edu Fila application demonstrated significant potential as an innovative digital tool for community-based health education. Its interactive and accessible format effectively improved knowledge and fostered positive behavioral attitudes, supporting broader public health strategies for filariasis prevention.

Keywords: Filariasis, Health Education, Smartphone Application, Digital Health, Knowledge, Attitude

INTRODUCTION

Filariasis, commonly referred to as elephantiasis, remains a significant public health concern in many tropical regions, including Indonesia [1,2]. This parasitic disease is caused by infection with filarial worms, which are transmitted to humans through the bites of mosquitoes from specific genera, including Anopheles, Culex, Mansonia, and Aedes [3,4]. Clinically, filariasis is characterized by symptoms such as swelling of the limbs and genitalia, which can progress to a chronic and severely debilitating condition [5].

As a chronic disease, filariasis can result in permanent disability, adversely affecting not only physical health but also the psychosocial and economic well-being of affected individuals [6]. Once inside the human body, filarial worms develop within the lymphatic system, where they can survive for up to six to eight years. The prolonged presence of the parasites leads to progressive damage of the lymphatic vessels, culminating in lymphedema, most commonly seen as the gross enlargement of extremities. This condition is often irreversible and poses substantial challenges for treatment and management [7].

Globally, the World Health Organization (WHO) estimates that over 120 million people are currently infected with filariasis, while approximately 1.1 billion individuals reside in areas at high risk of transmission. The majority of cases are concentrated in Southeast Asia and Africa, where climatic, environmental, and socio-economic conditions facilitate the proliferation of mosquito vectors responsible for disease transmission. Among those affected, an estimated 25 million men suffer from genital swelling, and over 15 million individuals live with lymphedema, many of whom lack access to adequate medical care [8].

Indonesia is recognized as an endemic country for filariasis and is uniquely notable as the only nation where all three major species of filarial worms *Wuchereria bancrofti*, *Brugia malayi*, and *Brugia timori* are present [2]. The disease is widespread, with cases reported in nearly all provinces. According to the Ministry of Health of the Republic of Indonesia, as of 2023, there were 7,955 reported chronic filariasis cases across 38 provinces. In Jambi Province alone, 224 cases were documented, underscoring the ongoing challenges in controlling and eliminating the disease [9].

The impact of filariasis extends beyond the individuals directly affected, influencing their families and the broader community [10]. Infected individuals often experience significant physical limitations that hinder daily functioning, reduce work productivity, and result in loss of income. Furthermore, many patients are subjected to social stigma and discrimination, which exacerbates their psychological and social burdens. Thus, filariasis represents not only a medical condition but also a substantial social and economic challenge [11].

Efforts to prevent the transmission of filariasis have included the implementation of various strategies, with community-based education emerging as a key component. Educational interventions play a crucial role in enhancing public knowledge and shaping attitudes toward disease prevention, including the use of mosquito nets, maintaining environmental sanitation, and avoiding mosquito bites. Although conventional approaches such as lectures, group discussions, and direct counseling have long been employed, they often encounter limitations related to coverage, accessibility, and effectiveness [12].

In the digital era, there has been a significant shift in the way individuals access information, including health-related content. The widespread use of smartphones has become an integral aspect of daily life, presenting opportunities to leverage digital

technology as an educational medium that is more effective, efficient, and capable of reaching broader audiences without the constraints of time and location [13].

Smartphone-based applications offer the flexibility for users to access health information anytime and anywhere. Interactive digital education platforms have been shown to enhance comprehension, engagement, and retention of information more effectively than conventional methods. Consequently, the integration of digital technologies into health promotion strategies is highly relevant in addressing the needs and behaviors of modern populations, who are increasingly reliant on digital devices [7,14].

Given the ongoing challenges in controlling filariasis, there is a critical need to strengthen technology-based educational strategies. Such approaches not only align with contemporary digital trends but also have the potential to expand outreach, foster positive behavioral change, and accelerate national efforts toward filariasis elimination in Indonesia.

METHODS

Study Design

This study employed a quantitative approach using a pre-experimental, one-group pretest–posttest design. In this design, a single group of participants is observed without the inclusion of a control group. Measurements are conducted both before and after the intervention to assess changes attributable to the intervention.

Settings

The study was conducted in the Muaro Jambi District, located in Jambi Province, Indonesia. This site was selected due to its status as a filariasis-endemic area with a high prevalence of cases, as well as its accessibility to digital technology, including widespread smartphone usage. The research was carried out over an eight-month period, from January to August 2024. During this time, several key activities were undertaken, including the development of research instruments, recruitment of participants, administration of the pretest, delivery of health education through the *Edu Fila* mobile application, and subsequent posttest assessments and data analysis.

Respondent

The study population consisted of residents within the working area of Muaro Jambi Regency. Inclusion criteria were as follows: individuals aged 18 years or older; the ability to read and comprehend educational content; access to and the ability to use a smartphone; and willingness to participate in all phases of the study.

The sample size was determined using the Slovin formula, which is commonly applied when the total population size is large, unknown, or not entirely accessible. The formula is used to calculate an appropriate sample size by considering a desired margin of error and confidence level. The Slovin formula used in this study is as follows:

$$n = \frac{N}{1+N(e)^2}$$

Assuming a large population and a margin of error (e) of 0.14, the calculated sample size was 50 participants. This number was deemed sufficient to detect meaningful

changes in knowledge and attitudes within a pretest–posttest design, while still allowing for appropriate statistical analysis.

Participants were selected using purposive sampling, a non-probability sampling technique in which individuals are chosen based on specific, predefined criteria. This approach ensured that the educational intervention delivered via the smartphone application could be effectively received and comprehended by the target population.

Variables

This study focused on two main aspects: the intervention provided and the outcomes observed. The intervention involved filariasis prevention education delivered through a smartphone-based application called Edu Fila. The application offered comprehensive educational content on filariasis, including definitions, modes of transmission, clinical signs and symptoms, potential health impacts, and community-based preventive measures. Designed to be user-friendly and easily accessible, the app enabled participants to understand and engage with the material independently.

The study assessed the respondents' knowledge and attitudes concerning filariasis transmission prevention, particularly before and after the educational intervention. Knowledge was assessed using a structured questionnaire consisting of 10 multiple-choice questions. Each correct response was scored as 1, and each incorrect response as 0, resulting in a total possible score ranging from 0 to 10. Higher scores indicated greater knowledge of filariasis. Attitudes were measured using 10 statement items based on a four-point Likert scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). A higher cumulative score reflected a more positive attitude toward efforts to prevent filariasis transmission.

Prior to data collection, the questionnaire instrument was subjected to validity and reliability testing. Validity was assessed using Pearson's Product Moment correlation. The results indicated that all items measuring knowledge and attitude had correlation coefficients (r values) greater than the critical value of *r* at the 5% significance level, indicating that all items were statistically valid.

Reliability was evaluated using the Cronbach's alpha coefficient. The knowledge instrument yielded an alpha value of 0.76, while the attitude instrument produced an alpha value of 0.81. Both values exceed the commonly accepted threshold of 0.60, suggesting that the instruments demonstrated acceptable internal consistency and were therefore considered reliable for use in this study.

Data Collection

Data were collected using a questionnaire comprising two main sections: one assessing knowledge and the other evaluating attitudes toward preventing filariasis transmission. The questionnaire was administered in two stages: once before (pretest) and once after (posttest) the educational intervention.

The educational procedure was conducted using the *Edu Fila* application, a smartphone-based digital platform specifically developed for this study. Education was provided in three sessions, each lasting between 30 and 45 minutes. The content covered various aspects of filariasis, including an introduction to the disease, its modes of transmission, clinical signs and symptoms, its impacts, and preventive measures that individuals and communities can adopt. The material was presented interactively, incorporating a combination of text, images, and educational videos designed for ease of understanding.

Following the completion of all educational sessions, respondents were asked to complete a posttest questionnaire, which included the same questions as the pretest. This posttest was administered to assess changes in the respondents' knowledge and attitudes regarding filariasis prevention after receiving the application-based education.

Data Statistic

Data analysis in this study was performed using both descriptive and inferential methods. Descriptive analysis was employed to summarize the demographic characteristics of the respondents, including gender, age, education level, and occupation. Additionally, it was used to calculate the mean, standard deviation, and the minimum and maximum scores for the respondents' knowledge and attitude, both before and after the educational intervention.

To assess the impact of the educational intervention delivered via the *Edu Fila* application, inferential analysis was conducted using a paired t-test. This test aimed to determine whether there was a statistically significant difference in respondents' knowledge and attitudes before and after receiving the digital education. The test was performed at a 95% confidence level ($\alpha = 0.05$), with results considered statistically significant if the p-value was less than 0.05.

RESULTS

The demographic characteristics of the respondents showed that the majority were female. In terms of age, most respondents were in the late adult age group. Regarding education level, most respondents had completed secondary education. In terms of occupation, most respondents worked in the informal sector, particularly in agriculture. A detailed analysis of the respondent characteristics is presented in Table 1.

The measurement of knowledge and attitude showed an increase following the educational intervention delivered via smartphone applications. Before the intervention, respondents' knowledge was categorized as low. After the intervention, the knowledge scores increased. The same trend was observed in the attitude scores. Prior to the intervention, respondents' attitudes toward filariasis prevention were less favorable. After the intervention, the attitude scores increased.

Statistical analysis using a paired t-test showed a significant difference between pre- and post-intervention scores for both knowledge and attitude variables. For the knowledge, the average score increased after the intervention. The paired t-test yielded a p-value of 0.000, indicating a statistically significant difference. For the attitude, the average score also increased. The statistical test also showed a p-value of 0.000

Table 1. Frequency Distribution of Respondent Characteristics

Characteristics	Frequency	Percentage
Sex		
Male	17	34,0
Female	33	66,0
Age		
Late adolescents	11	22,0
Early adults	12	24,0
Late Adults	27	54,0

Education		
No School	6	12,0
Elementary	4	8,0
Junior School	12	24,0
High School	21	42,0
College	7	14,0
Employment		
Farmer	20	40,0
Entrepreneur	9	18,0
Civil Servant	5	10,0
Not Working	16	32,0

DISCUSSION

The results indicate that smartphone application-based education has a significant impact on enhancing both community knowledge and attitudes toward preventing filariasis transmission. The observed increase in knowledge and positive attitude shifts following the educational intervention suggest that digital technology, as an educational medium, offers an effective and innovative solution for disseminating health information to the public [15].

The improvement in knowledge demonstrates that the educational materials delivered through the Edu Fila application were well received and comprehended by respondents. This suggests that the interactive and visually engaging format of the material effectively clarified key concepts, such as the causes, modes of transmission, and preventive measures for filariasis [16]. Furthermore, the accessibility of information through widely used devices, such as smartphones, is a crucial factor contributing to the success of this educational approach. The user-friendly design and intuitive interface of the Edu Fila app enable participants to engage with the material effectively, without encountering technical barriers [17]. This study is in line with the research by Godi M.D. et al. [18], which reported that interactive and self-directed smartphone-based health education interventions are effective in improving community knowledge, attitudes, and practices regarding the prevention of infectious diseases, including filariasis. It is also relevant to the study by Carrion et al. [14], which reported that the use of mobile applications is effective in increasing public knowledge and awareness of neglected tropical skin diseases, including filariasis, by focusing on effective communication strategies through mobile technology.

The positive attitudinal changes observed after the intervention further highlight that education not only fosters cognitive understanding but also raises awareness and promotes preventive behaviors. Respondents demonstrated greater support for filariasis prevention strategies, including maintaining environmental hygiene, avoiding mosquito bites, and participating in mass drug administration programs. Additionally, the Edu Fila application tracks users' progress, offering personalized feedback and motivating continued active participation in prevention efforts [19].

In line with the study by Jaiyeola et al. [20], it was reported that community-based education plays a crucial role in changing attitudes and practices related to the prevention of disease, particularly lymphatic filariasis, in two endemic communities in Nigeria. Similarly, the study by Yotsu et al. [21] reported that the eSkinHealth application proved

effective in detecting and managing neglected tropical skin diseases, including filariasis, by enhancing the engagement of community health workers through a mobile platform.

These findings align with behavior change theory, which posits that knowledge serves as the foundation for attitude formation, and attitudes, in turn, influence behavior [22]. When individuals are equipped with sufficient information and an understanding of disease risks, they are more likely to be receptive to altering their attitudes and behaviors [23]. In this context, digital educational media plays a pivotal role in effectively delivering information and directly reaching target audiences, free from the constraints of time and location. The Edu Fila application also features reminder and notification functionalities, which reinforce educational messages and sustain users' engagement with the content [24].

The success of education delivered through smartphone applications is further supported by the characteristics of the respondents, who are predominantly within the productive age group and possess a secondary education background. This demographic is generally more receptive to technology and demonstrates strong self-directed learning capabilities [25]. These traits underscore the suitability of digital media for health promotion strategies, particularly in the modern era. The Edu Fila app offers users the flexibility to learn at their own pace and convenience, thereby mitigating the limitations typically associated with traditional educational models.

From a methodological perspective, the use of a pretest-posttest design provides a clear depiction of changes in knowledge and attitudes before and after the intervention. Although the study lacked a control group, the observed changes within the same group lend validity to the findings, as they allow for direct comparison. Statistical analysis further confirmed the significance of these results, thereby supporting the conclusion that the intervention had a meaningful impact.

Overall, the findings of this study validate the potential of technology in enhancing the effectiveness of health education, particularly in areas with limited access to healthcare professionals. The Edu Fila app represents a modern and responsive approach to technology-based education, offering a practical and efficient means of reaching a broader audience. This strategy holds promise as an innovative component of sustainable, community-based disease prevention programs, with the potential for long-term benefits.

Limitation of Study

This study has several limitations. First, the respondents were predominantly from the productive age group and had a moderate level of education, both of which are characteristics that tend to be more receptive to technology. As a result, the findings may not be generalizable to other age groups or individuals with varying educational backgrounds. Second, the study employed a pretest-posttest design without a control group, which limits the ability to definitively attribute the observed changes to the use of the app alone.

Future research should aim to include a more diverse sample, encompassing a broader age range and varying educational levels, to enhance the generalizability of the findings. Additionally, adopting an experimental design with a control group is recommended to establish a clearer causal relationship between app usage and the observed changes. Furthermore, extending the duration of app usage and investigating its long-term effects would provide a deeper understanding of the app's role in fostering sustained behavior change.

CONCLUSION

The use of the Android-based Edu Fila application has proven effective in enhancing community knowledge and attitudes toward filariasis prevention. By leveraging digital technology, the app delivers health information in an interactive and visually engaging manner, thereby improving accessibility and promoting behavioral changes aimed at prevention. This app enables education to reach a wider audience without the constraints of time or location, offering a flexible and personalized learning experience.