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Original Research Paper

# Empowering rural adolescents in emergency response through first Aid App and indigenous-language short films

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## Abstract
First aid competence among adolescents is a crucial component of community-based disaster risk reduction, particularly in rural areas with limited access to emergency healthcare services. This study aims to evaluate the effectiveness of the First Aid Guidelines (FAG) mobile application and an indigenous-language short films in improving first aid knowledge, attitudes, and skills among junior high school students in a rural Indonesian setting. A quasi-experimental study without a control group involved 120 students who were selected through simple random sampling. Data were collected using validated questionnaires and simulation-based assessments. Statistical analysis employed the Wilcoxon and the Mann-Whitney U tests. Both the FAG application and the short film significantly improved students' first aid knowledge (p=0.001), with no significant difference in effectiveness between them (p=0.955). The FAG application significantly enhanced students' attitudes (p=0.001), while the short film did not (p=0.207). Conversely, the short film significantly improved practical first aid skills (p=0.001), but the application did not (p = 0.115). There were no statistically significant differences found between the two media in terms of attitude (p=0.955) and skill improvement (p=1.000). The use of both the FAG application and a culturally adapted short film was effective in improving rural adolescents' first aid knowledge. The FAG application was more impactful in shaping positive attitudes, but thee short film demonstrated greater efficacy in improving practical skills. The use of application-based educational technology and short films in school health curricula is recommended to enhance first aid skills in adolescents.

**Keywords:** adolescent; digital health intervention; first aid education; mobile application; rural setting

## 1. Introduction

First aid is the provision of life-saving first response and support to someone injured before treatment can be accessed (Singletary et al., 2020). Studies have indicated that appropriate first aid skills can reduce mortality and morbidity due to accidents and illnesses (Ellis, 2017). However, access to first aid education is limited in many rural areas where the health facilities are sometimes remote with doubtful guarantee of availability of personnel during emergencies.

Access to first aid education is limited in many rural areas where the health facilities are sometimes remote with doubtful guarantee of availability of personnel during emergencies (Lee et al., 2022). Nearly a million children and adolescents die each year due to preventable injuries, the majority of whom are in low and middle-income countries, including those in rural areas (Tupetz et al., 2020). The most common causes of death in these cases are deaths due to traffic accidents, drowning, burns, and falls. Good first-aid can improve the probability of survival and can also reduce the level of injury (Hoque et al., 2017).

Unfortunately, knowledge of first aid is below the optimal level in the adolescent population (Das et al., 2019). Reports from rural areas of Asia and Africa suggested that only 15–20% of junior high school students had knowledge of first aid, and <10% could perform rescue procedures properly in

emergency situations (Uddin et al., 2021). Our preliminary study found that 9 out of 10 junior high school students reported experiencing injuries or witnessing friends get injured while playing at school, but most did not know how to administer first aid. This suboptimal literacy may be systemic from improper access to effective training facilities, scarcity of trained trainers and lack of adequacy of health education curriculum in the educational sectors, among many other factors.

In rural settings, children are often the first responders in incidents, which is why they require essential training on first aid (Molly, 2020). However, studies suggest lower health literacy levels in rural adolescent school students as compared to urban students due to the inadequate educational facilities (Kayalkar & Dmello, 2024). In most school syllabi first aid training is not included systematically, and conventional teaching modalities are inadequate in enhancing the students' practical competence (Buck et al., 2015). The effectiveness of health education in rural areas is further hindered by language barriers, especially when educational materials are delivered in national languages that are not fully comprehensible to students (Adams, 2023). Previous research demonstrated that using the students' vernacular when learning could lead to better conceptual understanding and knowledge retention (Sumule & Iheanyi-Igwe, 2020). Hence, a more inclusive approach to education in the locality must be developed, one that reflects the local languages and cultures.

Along with the fast rate of technological development, the use of digital applications and audio-visual media tools in health education has increased significantly (Khafizova et al., 2023). An interactive health app has shown the potential in increasing user engagement and learning speed (O'Brien et al., 2024). A similar result was obtained from a study on audio-visual media in the form of shorts, which were effective when presenting health information in a more attractive and easier-to-understand form, particularly for young people (Trifitriana et al., 2020). However, there is little research on the improvement of first aid skills using digital technology and regionally language-based audio-visual first aid aid modules among rural school-going adolescents.

Due to the lack of accessibility, language barriers, and possibility of technology in health education, this study aims to evaluate the effectiveness of the First Aid Guidance (FAG) mobile application and an indigenous-language short film in improving first aid knowledge, attitudes, and skills among junior high school students in a rural setting.

## 2. Research Methods

The population in this study was all 740 students at a junior high school in East Java, Indonesia. The population was comprised of students across different grades with comparable access to health knowledge and first aid skills. The sample size is calculated by Slovin formula at 5% degree of precision 120 students were considered as suitable to represent the effect of intervention. A simple random sampling was taken on the list of students at the address of a female student's name, ensuring all students had equal chance of being selected through the use of a computerized randomization from the list of the class that contained the name of students.

We used within-subjects design or repeated measures design, where all participants receive both interventions. Each participant serves as their own control, which helps minimize variability due to individual differences (Kim et al., 2025; Richard et al., 2022). This approach was used to avoid the selection bias and increase the external validity of the results of the study. The data collection was carried out in two stages during two successive weeks – the first week was the FAG group and the second the regional language short films. Knowledge, attitudes, and skills were measured using instruments adapted from previously validated research (Ekaprasetia et al., 2018; Nastiti et al., 2023), with established reliability to uphold measurement integrity. Data collection followed a structured protocol to optimize validity and reproducibility.

The data analyses used were univariate and bivariate. Univariate analysis described data frequency and characteristics. Bivariate analyses using the Wilcoxon signed-rank test were used to assess the difference in pre-test and post-test scores within the intervention group. The Mann-Whitney U test was employed to assess the comparative effectiveness of two intervention methods (the FAG application and a local language short film) in improving first aid knowledge, attitudes, and skills. The results of the bivariate analysis are presented in the form of a p-value ($\alpha$=0.05) to determine the significance of the difference between the pre-test and post-test, as well as between the two intervention methods. The analysis was conducted using statistical software to ensure the accuracy of the calculations and the interpretation of the research results.

This research has received ethical approval from the Health Research Ethics Committee with the number: 2827/UN25.8/KEPK/DL/2024. All research procedures are carried out in accordance with the principles of research ethics, including respect for the rights of participants, maintaining data confidentiality, and ensuring that there are no risks that can harm research participants.

## 3. Results and Discussion

### 3.1. Characteristics of Participants

Based on Table 1, more than half of the participants in this study were male (50.8%), and the majority were in the 13-year-old age group (86%), which corresponds to the early stages of adolescent development at the junior high school level. This distribution is relevant for the study, as age and sex influence the interpretation and reaction to the educational materials of the first aid intervention.

**Table 1.** Characteristics of Participants

| Characteristics | Item | n | % |
|---|---|---|---|
| Sex | Male | 61 | 50.8 |
| | Female | 59 | 49.2 |
| **Total** | | **120** | **100** |
| Age | 12 | 8 | 3.4 |
| | 13 | 86 | 36.6 |
| | 14 | 25 | 10.6 |
| | 15 | 1 | 0.4 |
| **Total** | | **120** | **100** |

This gender distribution is noteworthy, as previous research has highlighted differences in learning styles and participation levels between males and females in health education activities. Male participants often tend to be more physically active, whereas female participants may demonstrate a more cautious approach in processing health-related information. Consequently, the predominance of male participants in this study could influence the dynamics of knowledge acquisition and comprehension of the first aid intervention materials, underscoring the importance of considering gender as a factor in evaluating the intervention's effectiveness (Saxena et al., 2024).

### 3.2. The Effect of the First Aid Guideline (FAG) Application and Short Films on Participants' Knowledge

The FAG application and the short film in local languages significantly enhanced participants' first aid knowledge ($p < 0.05$) (**See** Table 2). Both interventions had an almost equal effect on improving students' understanding. The post-test standard deviations were 3.527 for the FAG application and 2.486 for the short film, indicating some variability in knowledge gains within each group. However, there was no statistically significant difference in the overall effectiveness of the two intervention methods on participants' first aid knowledge ($p > 0.05$).

**Table 2.** Knowledge About First Aid

| Group | Time | Mean score | SD | Within-group p value | Posttest mean difference (FILM − FAG) | Between-group p value |
|---|---|---|---|---|---|---|
| FAG | Pretest | 10.15 | 2.611 | 0.001 | 0.24 | 0.955 |
| | Posttest | 11.28 | 3.527 | | | |
| FILM | Pretest | 9.96 | 2.324 | 0.001 | | |
| | Posttest | 11.44 | 2.486 | | | |

The results are in line with the multimedia learning principles which state that presenting contents visually and auditorily may enhance information processing by simultaneously engaging different channels of processing in the brain (Mayer, 2024). The findings indicate that digital technology combined with audio-visual media is an effective health education method for improving health literacy among rural adolescents. The effectiveness of the two media in increasing knowledge is consistent with earlier studies showing that digital and audio-visual educational strategies can positively affect health literacy in adolescents (Barbati et al., 2025; Kim et al., 2024). Furthermore, there was no significant difference in learning about first aid in general between the two groups. On the whole, findings report that interactive digital media, as well as local culture-based media, are recommended as alternative methods for teaching particularly in rural schools with less access to formal training to raise students' knowledge on what constitutes expedient initial first aid.

### 3.3. The Effect of the First Aid Guideline (FAG) Application and Short Films on Participants' Attitudes

Despite both media being effective in increasing knowledge, the result for attitude showed a different trend. The FAG had a shifting effect on positive attitudes towards first aid ($p = 0.001$) whereas the short film in the local language did not ($p = 0.207$) (See **Table 3**). The results indicated that the FAG was better in improving students' attitudes toward first aid than the short film, probably because FAG which may be attributed to its interactive and practical engagement. This is in line with previous studies indicating that digital applications may increase motivation and engagement in students through personalization and gamification mechanics that facilitate attitude change (Li et al., 2024). By contrast, the impact of short films on attitudes may be more situational, perhaps requiring longer or repeated exposure to emotional involvement and cultural congruity for measurable effects.

**Table 3.** Attitudes About First Aid

| Group | Time | Mean score | SD | Within-group p value | Posttest mean difference (FILM − FAG) | Between-group p value |
|---|---|---|---|---|---|---|
| FAG | Pretest | 32.88 | 2.158 | 0.001 | 7.43 | 0.955 |
| | Posttest | 11.28 | 1.751 | | | |
| FILM | Pretest | 19.07 | 2.322 | 0.207 | | |
| | Posttest | 18.71 | 2.120 | | | |

There was no significant difference between the two interventions in attitude change among the entire study population, The Mann-Whitney U-test for attitude ($Z = -0.057$, $p = 0.955$) confirms this. Therefore, although the FAG seemed to be better for some students, the general effect of the application on attitudes is not sufficiently strong to be even considered significant at the population level. The results highlight the need for attention to the psychological and social makeup of learners in health education interventions particularly in rural settings where culture play a big role.

### 3.4. The Effect of the First Aid Guideline (FAG) Application and Short Films on Participants' Skills

The results for first aid skills shown in Table 4 were different from those for knowledge and attitudes. Among the participants who trained with the FAG application, no significant skill enhancement was observed ($p = 0.115$, $p > 0.05$), suggesting the app had minimal influence on real-life first aid skills. Conversely, the short film group of the local language showed significant improvements in performance ($p = 0.001$), implying that this visual-auditory approach was more effective in improving students' practical first aid performance. These results suggest that, albeit FAG and short film had similar effects for knowledge and attitudes, short film was more effective in skills acquisition. This is probably because of the short film's visual demonstrations, which are easier for students to see, copy, and apply, she added. These findings are consistent with experiential learning theory, which assumes practical skills are best learned through observation and demonstration, with text-based or interactive formats as the sole medium (McLain, 2018; Naidoo & Hobden, 2021; Oliveira & Bonito, 2023). Similar previous researches indicate that video models containing authentic situations can help to improve motor skills through behavioral imitation (Obrusnikova & Rattigan, 2016).

**Table 4.** Skills about First Aid

| Group | Time | Mean score | SD | Within group p value | Posttest mean difference (FILM − FAG) | Between group p value |
|---|---|---|---|---|---|---|
| FAG | Pretest | 22.24 | 6.078 | 0.115 | 0 | 1.000 |
| | Posttest | 23.53 | 5.854 | | | |
| FILM | Pretest | 19.07 | 2.322 | 0.001 | | |
| | Posttest | 23.53 | 5.854 | | | |

While short films resulted in larger within-group improvements in skills, their effects on the population level were not significantly different from FAG ($p = 1.000$). The results suggest that for learning practical skills the short films were superior, while the FAG application was superior for cognitive learning and consolidation of skills after a longer period of time. Consequently, the best strategies for teaching first aid should encompass delivery through interactive digital technology and culturally appropriate audiovisual media to improve conceptual and contextual understanding, as well as practical competence in rural teenagers who do not have the opportunity to access hands-on training.

## 4. Conclusion

The current study shows a positive effect of introducing FAG app and two local language short films on students' first aid knowledge. A statistical test by the Wilcoxon signed-rank test proved that both educational media significantly increase the level of understanding of participants before and after intervention. But their impact on partially influencing students' attitudes and capabilities was different. FAG was more effective in establishing positive attitudes towards first aid, and the short films were better in enhancing practical skills. Although it adds to the literature on technology-based

health education and audiovisual media in rural schools, the study is not free from limitations. The lack of controls and short-term follow-up may limit the generalizability of these results. Hence, future research efforts need to take into account a comparison group and a longer follow-up to examine the long-term impact of these interventions.

The findings of this study bear significant practical implications for the design of first aid education programs in the school environment, especially in rural areas. The integration of a combination of digital and audiovisual media in local languages can serve as an effective strategy to enhance student preparedness in managing emergency situations. Therefore, the integration of application-based educational technology and short films into school health curricula is recommended to improve first aid skills among adolescents.

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