

Reproductive health education to improve knowledge and attitudes among blind adolescents

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Abstract

Blind adolescents face significant barriers to accessing reproductive health education, increasing their risk of misinformation and vulnerability to reproductive health issues such as Sexually Transmitted Infections (STIs) and sexual abuse. This study evaluates the effectiveness of Braille modules in improving the knowledge and attitudes of blind adolescents toward reproductive health. This quasi-experimental study used a one-group pretest-

posttest design with a Research and Development (R&D) approach. It was conducted in two phases: developing and validating a Braille module, followed by its implementation among 25 blind adolescents. The knowledge and attitude assessments were conducted using structured questionnaires. The Shapiro-Wilk test confirmed non-normal data distribution, and the Wilcoxon signed-rank test compared pre-test and post-test scores. The study found an increase in knowledge scores, with the minimum score rising from 0 (pre-test) to 25 (post-test) and the maximum score increasing from 75 to 85. The median knowledge score improved from 50.00 to 60.00, though not statistically significant ($p = 0.09$). For attitudes, the minimum score decreased from 30 to 28, whereas the maximum declined from 96 to 91, resulting in a small increase in the median attitude score from 81.50 to 82.00. This change was not statistically significant ($p = 0.10$). Adolescents with blindness may have better knowledge and attitudes regarding reproductive health if they use braille modules. However, combining them with other teaching strategies or media could increase their efficacy.

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Introduction

Health education is crucial for individual and community wellbeing. However, access remains limited for vulnerable populations, especially those with visual impairments.¹ Visual impairment due to illness, injury, or genetics significantly affects quality of life and social integration, limiting access to essential health information and services, including reproductive health education. Adolescence, a critical developmental stage characterized by rapid changes, requires an understanding of reproductive health for well-being. Unfortunately, the lack of access to visual learning materials exacerbates knowledge gaps, increasing the risk of unintended pregnancy, STIs, and sexual violence.²⁻⁴

The scale of the issue is substantial, particularly in Indonesia, where approximately 4 million individuals are estimated to have visual impairments, including adolescents.⁵⁻⁷ Limited access to visual information makes it challenging for blind adolescents to understand reproductive health topics, often leading to misinformation and unsafe practices. Barriers such as mobility restrictions, a lack of disability-friendly healthcare services, stigma, and inadequate family support further exacerbate this issue. These obstacles hinder access to essential reproductive health services, increasing the likelihood of reproductive health complications and social exclusion.^{8,9}

Several efforts have improved reproductive health education for adolescents, including the Adolescent Care Health Service (ACHS) and Youth Care Services (YCHS);¹⁰⁻¹² however, significant gaps remain. For visually impaired adolescents, alternative resources such as audio recordings, braille materials, and guided instruction have been introduced but remain insufficient and inconsistently implemented.^{9,13} Many visually impaired adoles-

cents lack access to comprehensive educational materials, whereas healthcare providers often have limited training in disability-friendly reproductive health education. Additionally, stigma and discrimination prevent blind adolescents from seeking appropriate health information and services.¹⁴⁻¹⁶

To address these challenges, a thorough and innovative reproductive health education program tailored to visually impaired adolescents is needed. The lack of reliable information sources and the shame associated with accessing them exacerbates disparities in reproductive health education. Despite equal rights to information and healthcare, barriers to access, social engagement, and mobility constraints create significant inequities.^{14,17,18} These limitations hinder their comprehensive understanding of reproductive health, increasing their vulnerability to unintended pregnancies, STIs, and sexual violence. Deficiency in knowledge and positive attitudes toward reproductive health adversely affect physical and mental well-being, reinforcing marginalization in education and healthcare.^{14,19}

Therefore, accessible learning materials and methodologies must be developed for blind adolescents, utilizing diverse media, such as braille, audio formats, and direct instruction. Collaboration among healthcare providers, educators, and disability organizations is crucial for program success. Addressing stigma and improving awareness among healthcare professionals and families are imperative.^{16,19} This study evaluated the efficacy of Braille modules in enhancing the knowledge and attitudes of blind adolescents regarding reproductive and sexual health. The findings are expected to provide insights for more inclusive educational programs and inform improved policies for the reproductive health of visually impaired teenagers.

Materials and Methods

Design study

This study developed and evaluated the efficacy of a Braille module to enhance the knowledge and attitudes of blind adolescents regarding reproductive and sexual health. A pre-experimental, one-group, pretest-posttest design was employed, incorporating a Research and Development (R&D) methodology. The module development process consisted of a needs analysis, design, expert validation, and preliminary testing. The module was tested in 25 special schools for visually impairments. Students who had completed the pre-test received the module as an intervention, and their performance was subsequently assessed through a post-test.

Population and Sample

The study population comprised all SLBN (*Sekolah Luar Biasa Negeri*) teenagers in Bandung City and Cimahi City. Participants were teenagers from SLBN A schools in these cities. Based on the results of paired numerical tests, the minimum required sample size was determined to be 25 students.²⁰ The sample size was calculated using Cohen's Sample Size Formula for Mean Differences.

$$n = \frac{(Z\alpha + Z\beta) S^2}{X_1 - X_2}$$

Information:

n : sample size

Z α : standard deviation alpha (degree of significance 95% then Z α = 1.96)

Z β : beta standard deviation (test power of the study 1- β = 80% then Z β = 0.84)

X₁-X₂ : minimum mean difference considered significant = 42

S : combined standard deviation determined from the literature (Kusuma and Budiono, 2017) = 18.1

Purposive sampling was employed in this study based on pre-defined inclusion and exclusion criteria. The inclusion criteria for the second phase of the study were as follows: adolescents aged 10 to 19 years who were enrolled in special needs schools, willing to participate in the entire research process, proficient in braille reading, able to read Braille letters accurately, owned a cell phone, and had the ability to use the TalkBack program. The exclusion criteria included adolescents with hearing impairments or those with additional challenges such as intellectual disabilities or autism

Data collection

Through the completion of a knowledge and attitude questionnaire, the respondents' knowledge and attitudes were gathered directly. To evaluate the validity and reliability of the measuring tool, a trial was conducted before the implementation of the questionnaire. The knowledge and attitude questionnaire was subjected to a validity test using the Pearson's product-moment correlation. The Cronbach's alpha reliability coefficient was employed in the instrument's reliability test.

This research was carried out in two phases: the initial phase of creating a Braille module involved analyzing the needs and characteristics of the students, with material elements referencing earlier qualitative research.²¹ The outline, layout, comprehension assessment, and delivery format were considered when designing the program. Following the preparation of the draft, material experts and media experts validated the module and made revisions based on their feedback. Before the final revision, the visually challenged students completed a readability test, which produced a final module for public trials.

Students at a special school for the blind were put on public trial during the second round. Before the experiment, an informed consent script was used to explain the research process, and consent was obtained individually using Google Forms, Zoom, Talkback, or Screen Reader software. Respondents were assembled in a school classroom for the pre-test, and the enumerator provided a clear explanation of how to complete the knowledge and attitude questionnaire. The enumerator had previously undergone training on post-tests, research observations, and data collection methods. The respondents used a smartphone and talkback application to access the digital version of the questionnaire.

After the pre-test, participants were given a Braille instructional module with a reading guide for each segment. Through the WhatsApp group, participants were asked to report what they understood. The duration of instruction with the Braille module was one week. A post-test was then administered once using a Google form to evaluate how much knowledge and attitudes had changed following the intervention.

Ethical clearance

This study was approved by the Health Research Ethics Commission of Poltekkes Kemenkes Bandung (number 49/KEPK//EC/X/2024). The respondents' signed consent was sought for primary data collection, with the assurance of anonymity and the option to withdraw at any moment.

Data analysis

Data analysis in this study included univariate and bivariate analyses. Based on the normality test, the data obtained from the Shapiro-Wilk results in the pretest and post-test are not normally distributed; therefore, a nonparametric test was carried out using the median value. Bivariable analysis was carried out to determine the differences in knowledge and attitudes before and after the education/information program using the Wilcoxon test because the data were not normally distributed.

Results

In this study, 25 respondents were obtained from SLBN A Pajajaran, Bandung City, SLBN Citeureup, and Cimahi City. Respondent characteristics include age, gender and education level.

Univariate analysis

Table 1 shows that the majority of respondents were aged 17–19 years (42%), female (67%), and with a high school education level (50%). Knowledge and Attitude Scores of Blind Adolescents

Table 2 presents the distribution of knowledge and attitude scores before and after the intervention. The minimum knowledge score increased from 0 (pre-test) to 25 (post-test), indicating improvement after receiving education. The maximum knowledge score increased from 75 to 85. Similarly, for attitude scores, the minimum score decreased slightly from 30 to 28, while the maximum score decreased from 96 to 91.

Bivariate analysis

A bivariate analysis was conducted to examine the effect of education on knowledge and attitudes before and after the intervention. Based on Table 3, the respondent knowledge scores between the pretest and the post-test had an increase in the median value of 10.00, and the attitude score had an increase of 0.5 medians before and after the intervention, although statistically, there was no difference in knowledge and attitudes before and after the intervention with $p > 0.05$.

Table 3 presents the differences in the knowledge and attitude scores before and after the intervention. The median knowledge score increased from 50.00 ± 5.0 (pre-test) to 60.00 ± 3.8 (post-test), while the median attitude score increased from 81.50 ± 4.0 to 82.00 ± 2.7 . However, statistical analysis using the Wilcoxon test indicated that these differences were not statistically significant, with p-values of 0.09 for knowledge and 0.10 for attitude, both exceeding the significance threshold of 0.05.

Discussion

The findings indicate that reproductive health education positively impacts knowledge among blind adolescents, although attitude score changes were not statistically significant. Most respondents were female (67%) and aged 17–19 years (42%), with half at high school level. These demographics provide a context for interpreting the results, as older adolescents and those with higher education may better understand and retain their health-related information.

Univariate analysis showed increased minimum and maximum knowledge scores after the intervention, suggesting that the program effectively enhanced the participants' understanding of

reproductive health. These findings align with research demonstrating a substantial knowledge increase from special education interventions for individuals with disabilities, including the blind. The comprehension of blind adolescents improves because of the techniques that facilitate information absorption.^{22,23} The trend of increasing knowledge scores among visually impaired teenagers suggests that providing reproductive health information through suitable media can enhance comprehension. However, the attitude scores showed a slight decrease in both the minimum and maximum values post-intervention. One explanation is that newly acquired knowledge may have led to cognitive dissonance, whereby participants reassessed their beliefs and attitudes toward reproductive health.^{24,25} This phenomenon has been observed in studies in which increased knowledge does not immediately translate into positive attitudinal changes.

The findings showed no significant correlation between reproductive health education and blind adolescents' knowledge, highlighting the complexity of influencing factors. This necessitates reassessing frameworks and methodologies that consider material accessibility, familial support, and social stigma. The ineffectiveness of formal education programs may stem from blind adolescents' preference for alternative sources such as e-modules, Internet resources, and TalkBack applications.^{26,27} Addressing publication bias is crucial, as scientific progress depends on reporting both nonsignificant and significant findings. Future research

Table 1. Respondent characteristics.

Variables	Respondents (n = 24)	Percentage (%)
Age (years)		
10-14	7	29
15-16	7	29
17-19	11	42
Gender		
Man	10	33
Woman	15	67
Education		
Elementary School	4	12
Junior High School	9	38
High School	12	50

Table 2. Distribution of knowledge and attitude scores of blind adolescents.

Indicator	Knowledge		Attitude	
	Pre-test	Post-test	Pre-test	Post-test
Minimum	0	25	30	28
Maximum	75	85	96	91

Table 3. Analysis of differences in knowledge of attitudes of blind adolescents before and after being given education.

Education	Median \pm SE		p
	Pre-test	Post test	
Knowledge	50.00 \pm 5.0	60.00 \pm 3.8	0.09*
Attitude	81.50 \pm 4.0	82.00 \pm 2.7	0.10*

Wilcoxon Test*.

should explore these results and refine the study design.^{28,29} Despite the lack of correlation, education can positively impact blind adolescents' reproductive health knowledge, as demonstrated by effective Braille modules covering human anatomy, reproductive functions, rights, and STI prevention. Accessibility-focused education enhances knowledge, reduces stigma, and fosters open discussions.^{30,31} Studies confirm that tactile perception in Braille aids knowledge acquisition, and specialized programs using Braille and accessible formats effectively educate blind adolescents on puberty, menstruation, bodily changes, and hygiene.^{18,30,31}

This study found that the increase in median attitude score of blind adolescents following the educational program was not statistically significant but suggested a favorable trend, indicating the potential of intervention in influencing adolescent attitudes. Attitudes toward reproductive health are shaped by multiple factors, including information, experiences, culture, social influences, and learning processes, encompassing perceptions, assessments, and willingness to act, with the social environment playing a crucial role.^{32,33} The theory of behavior changes highlights that attitudes develop through learning involving experience, comprehension, and social interaction. A positive attitude toward reproductive health may enhance visually impaired adolescents' awareness of critical issues, such as reproductive organ hygiene, personal boundaries, and preventing risky sexual behaviors. The increase in attitude scores may have been influenced by respondents' motivation to seek additional knowledge through electronic media after the intervention,^{13,21,34–36} suggesting personal initiative and external resources shape adolescents' attitudes. Effective education requires accessible formats, such as audio, braille, and interactive discussions, as conventional text-based or visual methods may be inadequate. Combining multiple media enhances behavioral outcomes.³⁷ Involving parents, educators, healthcare providers, and policymakers reinforces knowledge and fosters positive attitudes toward reproductive health.^{38–41} Education programs should integrate accessible learning formats, leverage technology, and promote stakeholder collaboration to ensure effective reproductive health education for blind adolescents.

This study had several limitations. The small sample size limited generalizability to visually impaired adolescents. Only short-term changes were measured, making it difficult to assess long-term impact. Factors like prior knowledge, cultural beliefs, and parental influence, which may have affected effectiveness, were not considered. The study relied on braille module educational methods without incorporating interactive or experiential learning. Future research should include larger samples, longer follow-up periods, and innovative methods to improve reproductive health education for blind adolescents.

Conclusions

Blind adolescents exhibited enhanced knowledge and attitudes following a reproductive and sexual health education intervention utilizing Braille modules, although the results were not statistically significant. Nonetheless, the rising trend indicates that braille modules may enhance the comprehension of visually impaired adolescents. The varied preferences for information access highlight the necessity for a more adaptable and technology-driven teaching methodology. Additional research is advised to incorporate a larger sample size, prolong the intervention time, and employ a broader range of instructional methods and media to enhance the effectiveness and significance of the impact.

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