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The Effect of Health Education Method Using Printed Booklet Media on Adolescents' Knowledge Level About Sexually Transmitted Diseases (STDs): A Pre-Experimental Study Among Grade XI Students of SMAN 3 Surabaya, Indonesia

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ABSTRACT Sexually Transmitted Diseases (STDs) are one of the reproductive health issues that remain a serious concern among adolescents. Lack of adequate knowledge, taboo perceptions within families, and exposure to unreliable information from the internet increase adolescents' risk of STDs. Effectif health promotion effort are needed to improve adolescents' knowledge, one of wich is through the use of educational media that is appropriate for the target audience. This study aims to analyze the effect of health education using booklets on adolescents' knowladge of STDs. This study uses a pre-experimental design with a one-group pretest-posttest approach. This study sampel consisted of high school students selected using total sampling technique. The intervention consisted of health education using booklets containing material on the definition of STDs, types of STDs, modes of transmission, sign and symptoms, and prevention effort. Data collection was conducted using a knowledge questionnaire administered before and after the intervention. Data analysis was performed using the wilcoxon test. The results showed a significant increase in students' knowledge levels after receiving education through the booklet, with a p-value < 0.05. The majority of students were in the good knowledge category on the post-test, and no students were found to have poor knowledge. These findings indicate that booklets are effective as a health education tool to increase adolescents' knowledge about STDs. The use of booklets can be an applicable and sustainable health promotion strategy in school.

INDEX TERMS Sexually Transmitted Infections, Health Education, Printed Media, Booklet, Adolescent Knowledge

I. INTRODUCTION

Sexually transmitted diseases (STDs) remain a significant global public health concern, particularly among adolescents [1]. Adolescents is a developmental phase characterized by biological, psychological, and social changes, accompanied by a high level of curiosity and identity identity [2]. These condition increase adolescents' vulnerability to engaging risky behaviors, including unsafe sexual practices, which in turn elevate the risk of STD transmission [3], [4]. A major contributing factor to this vulnerability is the lack of adequate knowledge regarding key aspects of STDs, including their definition, types, modes of transmission, signs and symptoms, and prevention strategies. Previous studies have shown that deficiencies in these specific knowledge domains are associated with higher engagement in risky sexual behaviors among adolscents.

In the digital era, the internet and social media have become primary sources of information for adolescents seeking knowledge about reproductive health. Although these platforms provide easy and rapid acces to information, not all available content is accurate, reliable, or evidence-based [5]. Exposure to misleading or incomplete information can result in misconceptions, incorrect beliefs, and even the normalis=zation of risky sexual behaviors related to STDs [6]. The issue is further compounded by limited open communication between parents and adolscents regarding reproductive health topics, wich are often perceived as taboo within the family context [7]. Consequently, adolescents tend to seek information independently without sufficient guidance or verification.

Given these challenges, structured and targeted health education is essential to improve adolscents' knowledge and

awareness of STDs [8]. Effective health education should not only deliver accurate information but also consider the characteristic and learning preferences of the target population to ensure optimal understanding and retention [9], [10]. In this context, educational media play a crucial role in facilitating the delivery of health messages. One such medium that has been widely used in health promotion is the printed booklet [11].

Printed booklets offer several advantages compared to digital information sources. Unlike internet-based content, which may vary in quality and credibility, booklet materials are curated, validated, and developed based on scientific evidence by health professionals. Booklets present information in a structured, concise, and systematic manner, often supported by visual illustrations that enhance comprehension. Furthermore, they allow adolescents to read independently, revisit the material repeatedly, and learn their own pace, thereby supporting better information retention [12], [13]. Previous studies have demonstrated that booklet-based health education is effective in improving adolescents' knowledge of reproductive health and STDs [14]–[15]. The advantages of booklets lie in their combination of text and images, the use of simple and communicative language, and their practical physical form, which makes them easy to carry and use at any time [16].

This study is grounded in health behavior education theories, particularly the Health Belief Model (HBM) and health literacy frameworks. The HBM suggests that increased knowledge about disease susceptibility, severity, benefits of prevention, and barriers to action can influence individuals' health behavior. In this context, improving adolescents' knowledge of STDs is expected to enhance their perception of risk and motivate preventive behaviors. Additionally, the concept of health literacy emphasizes the importance of individuals' ability to access, understand, and apply health information effectively in making informed health decisions.

Although previous studies have demonstrated the effectiveness of booklets as an educational media, their application with school settings requires further exploration, particularly in relation to students' characteristics and their dominant sources of information [17]. School represents a strategic setting for adolescent health promotion, as they provide direct access to the target population and are supported by structured health programs. Therefore, this study aims to analyze the effect of health education using printed booklet media on adolescents' knowledge of STDs among high school students.

II. METHOD

A. STUDY DESIGN AND RATIONALE

This study used a pre-experimental design with a one-group pretest–posttest approach [18]. This design was chosen to evaluate the effect of a health education intervention by comparing the conditions of respondents before and after treatment without involving a control group. This approach was considered appropriate because the study was conducted in a formal school setting, which had limitations in forming random control groups. Furthermore, ethically, all students

have the right to receive health education about sexually transmitted diseases (STDs) without any restrictions on treatment and non-treatment groups [18]. Through this design, changes in students' knowledge levels can be observed directly as a result of providing health education using booklets.

B. STUDY SETTING

This study was conducted at State Senior High School (SMAN) 3 Surabaya, East Java. The selection of the research location was based on the characteristics of senior high school students who are in mid-adolescence, an age group that is vulnerable to reproductive health and STDs issues. In addition, SMAN 3 Surabaya is a school with a structured learning system and a School Health Program (UKS), which supports the implementation of health promotion and education activities. This study was conducted in September 2025, all stages of the research process, including preparation, pretest administration, educational intervention using printed booklets, posttest administration, and data analysis. All procedures were carried out in a classroom setting to ensure consistency and optimal participation of students.

C. PARTICIPANTS AND SAMPLING METHOD

The population in this study consisted of all 11th grade students at SMAN 3 Surabaya. The 11th grade was selected based on the consideration that adolescents at this age have sufficient cognitive abilities to comprehend reproductive health material comprehensively. The sampling technique used was total sampling, in which all members of the accessible population who met the inclusion criteria were respondents. This approach was chosen due to the relatively small and manageable population size, allowing the researchers to include all eligible students to obtain comprehensive data and avoid sampling bias. In addition, total sampling was considered appropriate in the school setting to ensure that all students had equal access to health education, in line with ethical considerations that no student should be excluded from receiving important reproductive health information.

The final sample size consisted of 70 eleventh-grade students.

The inclusion criteria were students who were present during the data collection period, were willing to participate as respondents, and completed all stages of the study, including the pretest and posttest. The exclusion criteria included students who were absent during any stage of the study or did not complete the questionnaire.

D. MATERIALS AND EDUCATIONAL INTERVENTION

The intervention provided in this study was health education using printed booklets about sexually transmitted diseases. The booklet was compiled based on a literature review and tailored to the characteristics of high school adolescents [12], [13]. The material presented in the booklet included the definition of STDs, types of STDs, modes of transmission,

signs and symptoms, the impact of STDs on health, and STD prevention efforts.

The booklet was designed using simple, communicative language and was equipped with visual illustrations to increase reading interest and facilitate student understanding. Education was provided directly by researchers with a brief explanation of the booklet's contents, after which students were given the opportunity to read and study the booklet independently. This approach aimed to adjust to each individual's learning speed and increase the retention of information received by students [14], [15].

E. DATA COLLECTION INSTRUMENTS AND PROCEDURE

The research instrument used was a questionnaire on knowledge about STDs, which was compiled in the form of closed questions. The questionnaire covered several aspects, namely the definition of STDs, types of STDs, modes of transmission, signs and symptoms, and efforts to prevent STDs [19]. Knowledge measurement was carried out to assess changes in students' knowledge levels before and after the educational intervention [20].

The data collection procedure began with a pretest to measure students' initial level of knowledge about STDs. After the pretest, respondents were given a health education intervention using a booklet [17]. Next, a posttest was conducted using the same questionnaire to assess changes in students' knowledge levels after the intervention. The entire data collection procedure was carried out uniformly for all respondents to minimize measurement bias.

F. DATA ANALYSIS

The collected data was analyzed using statistical software. Descriptive analysis was used to describe the distribution of students' knowledge levels before and after the educational intervention. To determine the difference in knowledge levels before and after the provision of health education using booklets, the Wilcoxon Signed Rank Test was used because the data was ordinal and not normally distributed [21]. A p-value < 0.05 was set as the statistical significance threshold.

Adolescents' knowledge of sexually transmitted diseases (STDs) was measured using a structured questionnaire consisting of several items covering definitions, types, modes of transmission, signs and symptoms, and prevention of STDs. Each correct answer was scored 1, and each incorrect answer was scored 0, with the total score converted into a percentage.

The level knowledge was categorized based on the percentage of correct answers as follows:

- Good: 80-100%
- Moderate: 60-79%
- Poor: <60%

This categorization was used to facilitate interpretation of students' knowledge levels and to assess the extent of improvement before and after the educational intervention.

G. ETHICAL CONSIDERATIONS

This study was conducted in accordance with the principles of health research ethics [22]. Before the study was conducted, the researchers obtained permission from the school. Respondents were given an explanation of the objectives, benefits, and procedures of the study, and were assured of the confidentiality of their identities and the data provided. Student participation was voluntary, and respondents had the right to refuse or withdraw from the study at any time without academic consequences. In addition, this study meets the ethical standards approved by the Health Polytechnic Ethical Committee of the Ministry of Health Surabaya (No.EA/3862/KEPK-Poltekkes_Sby/V/2025).

III. RESULTS

This research was conducted in September 2025 at SMAN 3 Surabaya. SMAN 3 Surabaya is a public high school with A accreditation. Geographically, this school is located on Jl. Memet Sastrowiryo, TNI AL Complex, Kenjeran District, Surabaya City, East Java Province.

SMAN 3 Surabaya uses the Merdeka Curriculum, which emphasizes character development, critical thinking skills, and project-based learning, including in the field of adolescent health. The human resources at this school consist of competent teachers and professional educational staff. These conditions make SMAN 3 Surabaya a relevant location for this study.

TABLE 1
Frequency Distribution of Characteristics of Students at SMAN 3 Surabaya

| Characteristic | | Frequency (f) | Percentage (%) |
|---|--|---------------|----------------|
| gender | Male | 16 | 22,8% |
| | Female | 54 | 77,1% |
| | Total | | 70 |
| Sources of information about sexually transmitted diseases (STDs) | Parent | 2 | 2,9% |
| | Internet | 59 | 84,3% |
| | Friend | 3 | 4,3% |
| | Health workers | 6 | 8,6% |
| | Total | | 70 |
| | Communication between parents and children | Very open | 10 |
| Fairly open | | 26 | 37,1% |
| open | | 29 | 41,4% |
| Less open | | 5 | 7,1% |
| Not open all | | | |
| Total | | 70 | |

According to the information in TABLE 1, almost all students (77.1%) are female. In terms of information sources, almost all students (84.3%) obtained information from the internet, and a small number of students (2.9%) obtained information from their parents. This indicates that students rely more on the internet than interpersonal or professional sources when seeking information about sexual health.

Based on the research results in terms of parents' openness in discussing topics related to reproductive health or sexually transmitted diseases, almost half (41.4%) were dominated by the less open category, and a small proportion of students (7.1%) had parents who were not open at all to topics related to reproductive health or STDs.

TABLE 2

Distribution of Results Knowledge of Grade XI Students About Sexually Transmitted Diseases Before Providing Health Education Using Booklets

| Category | Frequency | % |
|--------------|-----------|-------------|
| Good | 3 | 4,2% |
| Moderate | 43 | 61,4% |
| Poor | 24 | 34,2% |
| Total | 70 | 100% |

According to the information presented in **TABLE 2**, explained the level of knowledge of grade XI students before being given health education using booklets showed that most students (61.4%) had sufficient knowledge. Meanwhile, a small number of students (4.2%) had good knowledge about STDs.

TABLE 3

Distribution of Results Knowledge of Knowledge of Grade XI Students About Sexually Transmitted Diseases After Being Given Health Education Using Booklets

| Category | Frequency | % |
|--------------|-----------|-------------|
| Good | 64 | 91,4% |
| Moderate | 6 | 8,5% |
| Poor | 0 | 0% |
| Total | 70 | 100% |

According to the information presented in **TABLE 3**, explained that after the intervention, almost all students (91.4%) had good knowledge of STDs. Meanwhile, a small number of students (8.5%) had adequate knowledge of STDs, and none of the students had poor knowledge.

TABLE 4

Cross-Tabulation of Students' Knowledge Levels About Sexually Transmitted Diseases Before and After Health Education Using Booklets

| | | Post test | | | | |
|---------------------------|----------|------------|----------|------|-------|-------|
| | | Good | Moderate | Poor | Total | |
| Pre test | Good | Count | 3 | 0 | 0 | 3 |
| | | % of total | 4,3% | 0% | 0% | 4,3% |
| | Moderate | Count | 41 | 2 | 0 | 43 |
| | | % of total | 58,6% | 2,9% | 0% | 61,4% |
| | Poor | Count | 20 | 4 | 0 | 24 |
| | | % of total | 28,6% | 5,7% | 0% | 34,3% |
| Total | | Count | 64 | 6 | 0 | 70 |
| | | % of total | 91,4% | 8,6% | -0% | 100% |
| Uji Normalitas | | | 0,000 | | | |
| Wilcoxon Signed Rank Test | | | 0,000 | | | |

According to the findings presented in **TABLE 4**, before receiving health education using printed booklets, the majority of students (61.4%) had a moderate level of knowledge about sexually transmitted diseases (STDs),

while only a smaller proportion demonstrated good knowledge.

After the educational intervention, a substantial improvement in knowledge levels was observed. The majority of students (91.4%) achieved a good level of knowledge, indicating a marked shift from moderate to good knowledge categories. This change reflects not only statistical significance but also meaningful educational improvement, as most students progressed to a higher knowledge category after the intervention.

The results of the Wilcoxon Signed Rank Test showed a significance value of $p = 0.000$ ($p < 0.05$), indicating that there is a statistically significant difference in knowledge levels before and after the intervention. Therefore, H1 is accepted, meaning that health education using printed booklet media has a significant effect on improving students' knowledge.

In practical terms, this finding suggests that booklet-based education is highly effective in enhancing adolescents' understanding of STDs, as evidenced by the considerable increase in the proportion of students with good knowledge. This improvement highlights the potential of printed booklets as an accessible and impactful educational tool in school-based health promotion programs.

IV. DISCUSSION

A. IDENTIFYING THE LEVEL OF KNOWLEDGE OF GRADE XI STUDENTS ABOUT SEXUALLY TRANSMITTED DISEASES BEFORE PROVIDING HEALTH EDUCATION USING BOOKLETS

Based on the results of the study, it was found that before receiving health education using booklets, most 11th grade students at SMAN 3 Surabaya had a sufficient level of knowledge about sexually transmitted diseases (STDs). Meanwhile, nearly half of the students had insufficient knowledge, and a small number of students had good knowledge. adolescents' low knowledge of reproductive health is influenced by counseling methods that are uninteresting and not tailored to the characteristics of the students. Passive educational media, such as lectures, are considered ineffective in improving adolescents' understanding of reproductive health information [20]

Students' low initial knowledge is also influenced by family and school environmental factors. The continuing taboo surrounding discussions of reproductive health means that students rarely receive adequate formal education, either at home or at school. In addition, the lack of youth health promotion activities in schools that specifically address STDs issues contributes to students' limited understanding [18]. This shows that students' low knowledge is not only caused by uninteresting educational methods, but also by a learning and social environment that does not support openness about reproductive health information [21].

Based on the characteristics of the respondents, most of the students in this study were female. According to Pristya et al. (2024), adolescent girls tend to be more open to reproductive health issues than boys [23]. However, the pretest results showed that only a small proportion of female

students had good knowledge about STDs. This condition indicates that openness to reproductive health topics is not always followed by access to valid information. The low level of openness in parental communication when discussing reproductive health issues means that students, both female and male, do not obtain adequate information from primary sources within the family.

In addition to family factors, students' high dependence on the internet as a source of reproductive health information also contributes to their low initial knowledge. Although the internet is the main source of information for adolescents due to its ease of access, the information obtained is not always credible and verified [5]. The lack of health literacy and the ability to assess the accuracy of information puts adolescents at risk of gaining a false understanding [6]. Therefore, the low level of knowledge among students in the pretest stage confirms the need for targeted, engaging, and valid source-based educational interventions, such as the use of booklets.

B. IDENTIFYING THE LEVEL OF KNOWLEDGE OF GRADE XI STUDENTS ABOUT SEXUALLY TRANSMITTED DISEASES AFTER PROVIDING HEALTH EDUCATION USING BOOKLETS

Based on the results of the study, after conducting health education interventions using booklets, there was a significant increase in students' knowledge levels. Almost all students had good knowledge about STDs, a small number of students had sufficient knowledge, and none of the students had poor knowledge. These findings are in line with research by LN Tambunan and Zhamita et al. (2023), which states that booklets are effective in increasing adolescents' knowledge about sexually transmitted diseases. Booklets are considered capable of conveying material in an interesting, informative, and easy-to-understand manner, thereby encouraging an increase in students' understanding [14], [15].

The effectiveness of booklets is also supported by the characteristics of the medium, which allows students to learn at their own pace and repeat the material as needed [13]. Attractive visual design, simple and communicative language, and a practical physical form make it easier for students to understand the material through a combination of text and images [12].

In addition, the use of booklets as targeted print media can overcome the limitations of information obtained from the internet. Karima et al. (2023) stated that internet-based information sources are not always accurate, so educational interventions using booklets can help correct misperceptions and strengthen adolescents' understanding of STDs. [5]. Thus, the increase in students' knowledge after the intervention shows that booklets are an effective health education medium that is suitable for adolescents [24]. The use of booklets in school health promotion activities can be an applicable and sustainable strategy in increasing adolescents' knowledge and awareness of the dangers of sexually transmitted diseases.

C. ANALYZING THE EFFECT OF HEALTH EDUCATION METHODS USING PRINTED BOOKLETS ON IMPROVING ADOLESCENTS' KNOWLEDGE OF SEXUALLY TRANSMITTED DISEASES (STDs) AMONG 11TH GRADE STUDENTS AT SMAN 3 SURABAYA

Based on the findings of this study, there was a substantial improvement in the knowledge level of 11th-grade students after receiving health education using printed booklet media. Prior to the intervention, most students demonstrated a moderate level of knowledge, with only a small proportion categorized as having good knowledge. Following the intervention, a marked shift was observed, with the majority of students achieving a good level of knowledge. This indicates that the booklet-based educational intervention was effective in facilitating meaningful learning improvements among adolescents.

The statistical analysis further supported these findings, with a p-value < 0.05 indicating a significant difference in knowledge levels before and after the intervention. This result confirms that health education using printed booklets has a statistically significant effect on improving adolescents' knowledge of sexually transmitted diseases. Beyond statistical significance, the substantial increase in the proportion of students with good knowledge also demonstrates a meaningful educational impact, highlighting the effectiveness of booklet-based learning in school settings.

The findings are consistent with previous studies, which have shown that educational media tailored to the characteristics and needs of the target audience, particularly those incorporating visual elements, can significantly enhance health knowledge [18]. Booklets allow students to engage in self-paced learning, revisit the material as needed, and process information more deeply, leading to better retention and understanding [24].

From a theoretical perspective, this study aligns with cognitive learning theory and health behavior frameworks such as the *Health Belief Model (HBM)*. Cognitive learning theory emphasizes that learning is more effective when individuals actively process information through meaningful engagement and visual stimulation. The structured and visually supported content of booklets enhances cognitive processing and facilitates knowledge internalization [20], [25]. In addition, according to the HBM, increased knowledge can influence adolescents' perceptions of susceptibility and severity of STDs, as well as the perceived benefits of preventive behaviors, which may ultimately contribute to positive health behavior changes.

However, this study has several limitations that should be considered when interpreting the findings. First, the use of a pre-experimental design without a control group limits the ability to attribute changes in knowledge solely to the intervention, as external factors may also have influenced the results. Second, the study was conducted in a single school setting, which may limit the generalizability of the findings to other populations or contexts. Third, the measurement of outcomes was limited to short-term knowledge

improvement, without assessing long-term retention or actual behavioral changes related to STD prevention.

Despite these limitations, the findings have important implications for nursing practice and adolescent health promotion. Printed booklets can be utilized as an effective, low-cost, and accessible educational tool for school nurses, community nurses, and health educators in delivering reproductive health education. Integrating booklet-based education into school health programs may enhance students' knowledge and support early prevention efforts against STDs. Furthermore, combining booklet media with other educational approaches, such as interactive discussions or digital media, may further strengthen learning outcomes.

V. CONCLUSION

This study proves that health education using printed booklets has a significant effect on increasing the level of knowledge of sexually transmitted diseases (STDs) among 11th grade students at SMAN 3 Surabaya. Statistical analysis shows a significant difference between the students' level of knowledge before and after the intervention, confirming the effectiveness of booklets as a medium for health education.

The effectiveness of booklet-based education highlights its potential as an accessible, structured, and adolescent-friendly learning medium. The combination of concise material, simple language, and visual support enables students to better comprehend sensitive reproductive health topics and supports independent and repeated learning. However, the presence of a small proportion of students who remained at a moderate level of knowledge suggests that educational interventions alone may not fully address all influencing factors. External factors such as limited parent-adolescent communication and reliance on unverified digital information sources may continue to affect adolescents' knowledge acquisition.

Therefore, it is recommended that future research conduct longitudinal studies to evaluate the sustainability of knowledge improvement and its impact on adolescents' behavioral changes related to STD prevention. In addition, integrating booklet-based education with family-based education approaches is strongly encouraged to strengthen communication and support from parents. Furthermore, future studies should compare the effectiveness of printed booklet media with digital education platforms to identify the most optimal and adaptive strategies for adolescent health promotion in the digital era. In conclusion, booklet-based health education is an effective approach to improving adolescents' knowledge of STDs and has strong potential to be implemented as part of comprehensive, sustainable, and multi-component school health promotion programs.

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DECLARATIONS

ETHICAL APPROVAL

This study was conducted by ethical standards and has received approval from the Institutional Review Board (IRB) of Poltekkes Kemenkes Surabaya, Indonesia, with approval number (No.EA/3862/KEPK-Poltekkes_Sby/V/2025). Informed consent was obtained from students in grade XI at SMAN 3 Surabaya. Confidentiality and anonymity were maintained throughout the research. All research procedures complied with the ethical standards established for research involving human participants.

CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

COMPETING INTERESTS

The authors declare no competing interests.

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