Original Research

The Indonesian Journal of Public Health
Vol 18. No. 3 December 2023
p- ISSN 1829-7005 e- ISSN 2540-8836

FLASHCARD-BASED ONLINE EDUCATIONAL GAME FOR IMPROVING HIV-AIDS KNOWLEDGE AND STIGMA

Intan Farida Yasmin[1*], Titiek Djannatun[1], Dian Widiyanti[1]
[1]Faculty of Medicine, YARSI University, Jakarta Pusat, Indonesia
Corresponding address: Intan Farida Yasmin
Email: intan.farida@yarsi.ac.id

ABSTRACT

Introduction: The burden of HIV-AIDS cases in Indonesia remains high, while HIV-AIDS promotion programs targeting students remain low. Game-based learning has not been investigated as an alternative method for improving HIV-AIDS awareness among students. **Aims:** this study quantifies the impact of the flashcard-based educational game invented by YARSI HIV-AIDS Care on high school students in Jakarta. **Method:** A simple randomized controlled study was conducted among 112 SMA 27 Jakarta students (intervention, n=56; control, n= 56). The HIV-AIDS knowledge and attitude scores before and after the educational game were evaluated using a validated questionnaire. An intervention using a flashcard-based game is conducted online. Univariate and Bivariate analyses of the pre-and post-scores for both groups were performed. **Result:** Following the game, there was a considerable improvement in the HIV-AIDS comprehensive knowledge scores (pre-test vs. post-test, 65 vs. 90, $p<0.01$), while the control score remained unchanged. The intervention group also had higher knowledge and attitude scores than did the control group ($p<0.01$). **Conclusion:** Flashcard-based education games significantly increased comprehensive HIV-AIDS knowledge and positive attitudes toward HIV-AIDS. Thus, this method could be implemented in HIV-AIDS promotion programs that target students.

Keywords: HIV-AIDS, Educative Games, Students, Health Promotion, Game-based learning

INTRODUCTION

The number of new HIV-positive cases in Indonesia has been increasing annually. The age groups with the largest percentage of HIV-positive cases were 25-49 years (70.4%) and 15-24 years (18.2%) (Ministry of Health Indonesia, 2019). DKI Jakarta is one of the most prevalent HIV cases in Indonesia, with 51.981 cases in 2017, 58.877 cases in 2018, and 65.578 cases in 2019 (Directorate General of Disease Prevention and Control, 2018, 2019, 2020). A total of 282 university students in Indonesia were diagnosed with AIDS in 2018. Thus, it has increased by 1.3 times compared to 2017 (Directorate General of Disease Prevention and Control, 2018, 2019). These data follow the increasing number of HIV cases in the 15-19 year age group, rising yearly (Directorate General of Disease Prevention and Control, 2018). However, there is no available data regarding HIV cases among students in DKI Jakarta.

Although knowledge is crucial in determining one's actions, a lack of understanding of HIV transmission and prevention contributes to a high number of new HIV-positive cases (Hong et al., 2012; Swenson et al., 2010). Knowledge-based behavior is preferable to unknowledge-based behavior. Because a person's attitude is related to his knowledge, if he lacks knowledge about how to prevent HIV-AIDS transmission, he will likely be unable to do so (Shewarega et al., 2022; Swenson et al., 2010). In addition, ignorance increases the likelihood of believing in HIV-AIDS hoaxes and myths, which contributes to the stigmatization of People Living with HIV (PLHIV) (Sallam et al., 2022; Sen et al., 2021; Yang et al., 2006).

According to the 2012 Indonesia Demographic and Health Survey, approximately 61.8.2% of women and 55.8% of married men between the ages of

Cite this as: Yasmin, I.F., Djannatun, T and Widiyanti, D, (2023). Flashcard-Based Online Educational Game for Improving HIV_AIDS Knowledge and Stigma. The Indonesian Journal of Public Health, 18(3), 457-469. https://doi.org/10.20473/Ijph.v18i3.2023.457-469

 Received 25 October 2021, received in revised form 2 January 2023, Accepted 6 January 2023, Published online: December 2023.Publisher by Universitas Airlangga

15 and 24 years were unaware of how to avoid HIV transmission. Overall, 11% of women and 12% of married men between the ages of 15 and 49 years have a thorough understanding of AIDS. This knowledge decreases with younger age, lower level of education, and lower income (Ministry of Health Indonesia, 2013). The level of knowledge of the Indonesian population regarding HIV-AIDS is low, and has not yet reached the national target of 95%. The current state of reproductive health in Indonesia is still not as developed as in other ASEAN countries, according to an analysis of the report from the Directorate General of Public Health of the Ministry of Health and Social Welfare of the Republic of Indonesia. (Ministry of Health Indonesia, 2013).

A person's knowledge of HIV-AIDS correlates with the stigma against HIV-AIDS. A high degree of understanding of HIV-AIDS is attributed to an increase in favorable attitudes (lowering stigma) towards people with HIV-AIDS, as claimed by several research findings from Indonesia and other countries (Alemi & Stempel, 2019; Harapan et al., 2013; James & Ryan, 2018; Kusuma et al., 2020; Shah et al., 2020; Youssef et al., 2021). Consequently, one of the efforts to reduce stigma discrimination to achieve zero stigma discrimination in 2030, according to the government's target, is to increase knowledge in the community, especially among adolescents, who are at risk of contracting HIV-AIDS. This further emphasizes the importance of socializing comprehensive HIV-AIDS knowledge as early as possible. This is particularly true for adolescents whose reproductive functions have matured both anatomically and physiologically.

Owing to several factors, the reported number of adolescents living with HIV is lower than the actual number. First, the age range of adolescents is often included in the window period, which still shows negative HIV test results. Second, there is a lack of awareness about taking HIV screening tests because of insufficient knowledge. Therefore, health promotion and prevention efforts regarding HIV-AIDS must be increasingly encouraged among students in large cities, especially in DKI Jakarta, the province with the most HIV-AIDS cases in Indonesia.

Despite numerous campaigns promoting and preventing HIV-AIDS transmission among high-risk populations, few programs are aimed at adolescents. The methods used to educate students often use conventional methods, such as lectures or counselor training. However, due to the limited number of HIV-AIDS experts and counselors, time, and other resources, HIV-AIDS promotion and education programs among high school students are not running continuously.

Learning media that can be accessed at any time and location could promote and educate more students continuously and cover more areas, including remote regions, where health experts and counselors are not always available. The use of gamification as a learning method for adolescents has been shown to be effective in enhancing knowledge. Most educational games use board games as educational media. No educational flashcard-based games are available. This study aims to analyze and measure the impact of a flashcard-based educational game on players' HIV/AIDS knowledge and attitudes.

METHODS

This study used a population of class XI students at SMA Negeri 27 Jakarta and a quasi-experimental pretest-posttest approach. Class XI students were selected because they were already 15 years old, which was the inclusion criterion for the questionnaire (National Institute of Health Research and Development, 2010). Class XII was not selected because of the emphasis on final exam preparation.

A total of 112 students from class XI were chosen from the seven classes to participate in this study. The students were

randomly selected by their class teachers to participate in the study. The inclusion criteria were age ≥ 15 years, Internet access and communication devices supporting zoom meetings, and consent to participate in this study. The exclusion criteria were unhealthy conditions and inability to attend the Zoom Meeting.

All students received explanations and provided their consent before participating in the study. This study was also approved by the Research Ethics Committee of Yarsi University (No:297/KEP-UY/BIA/VIII/2021). The data collection for this study was conducted from September to October 2020. The 112 students were then divided into two groups. Table 1 summarizes the two groups: the intervention group (n = 56) and the control group (n = 56).

The dependent variable was students' HIV/AIDS-related knowledge and attitudes. The independent variable was intervention using an online flashcard-based educational game, YARSI HIV-AIDS Care Smart Card, which had received copyright with no. EC00202049818, with an application date of November 16, 2020. The researcher developed this educational media, consisting of 20 cards containing True and False information about HIV-AIDS, to increase adolescent knowledge about the transmission, prevention, symptoms, and treatment of HIV-AIDS.

Students' knowledge and attitudes were measured using an online questionnaire before and after the game's intervention. The questionnaire used in this study consisted of 25 questions assessing HIV-AIDS knowledge (20 items, possible range 0-100) and attitudes (5 items, possible range 4-20). The questions were adapted from a questionnaire used in RISKESDA 2010 (National Institute of Health Research and Development, 2010) and Saputra study (Saputra, 2008). The final questionnaire used in this study was tested for validity and reliability using SPSS 25.

Large-scale social restrictions were implemented during the COVID-19 Pandemic in Jakarta, large-scale social restrictions (PSBB) were implemented. As a result, the YARSI HIV-AIDS Care Smart Card game intervention had to be carried out online using the zoom meeting platform. Students were divided into groups of seven, with each group guided by a health expert mentor. The Smart Cards were read and displayed, and the students were asked to answer simultaneously by giving a "true" (thumbs up) or "false" (wave) reaction. The mentor then explains whether the statement is true or false using the information written on the Smart Card. The intervention was held for 40 min in each group for one session only. After the virtual educational game sessions were completed, the intervention and control groups were asked to fill out the post-test questionnaire, despite the control group not receiving any intervention or education.

Statistical analyses were performed using univariate and bivariate analyses Using Microsoft Excel 2019 and SPSS 25. The Kolmogorov-Smirnov test was used to determine normalcy levels. Due to the non-normal distribution of the data, the Wilcoxon signed-rank test was employed to compare the students' knowledge and attitude scores before and after the game interference in each group. The Mann-Whitney test was performed to investigate whether the post-test results of the intervention and control groups differed. McNemar's test was used to assess the proportion of correct responses in each group before and after running the educational game, while Fisher's Exact Test was used to compare the two groups.

RESULTS

Table 1. displays the participant characteristics for this investigation. There was not significantly different between the proportion of female (63 percent) and male students (37 percent) in this study. The students' ages ranged from 15 to 18 years, with a median age of 16. Furthermore, there was no difference between the intervention

and control groups in terms of baseline knowledge and attitude scores.

HIV-AIDS knowledge scores before and after the educational game are presented in Table 2. The reliability score of the questionnaire used to measure HIV-AIDS knowledge was calculated using Cronbach's alpha, and the score was 0.829. As shown in Table 2, HIV-AIDS knowledge scores were compared before and after the educational game, and between the intervention and control groups. After playing the educational game, the intervention group's total score increased by 1.4 times, while the control group's score remained unchanged (p<0.01 vs p=0.35, respectively).

Subsequent analysis revealed that the final total score of the first group was considerably higher than that of the second group (p<0.01). The total score represents the sum of HIV-AIDS transmission, prevention, appearance of HIV-positive people, and cure for HIV-AIDS scores. The intervention group showed a higher final score in all subtopic scores than did the previous and control groups. Furthermore, the first group achieved an almost full mark (90-100) regarding HIV-AIDS transmission, prevention, appearance, and cure after playing the YARSI HIV-AIDS Care Smart Card game.

The detailed items answered by students in this study are listed in Table 3. This table also displays the proportion and comparison of students' correct answers before and after the game. Regarding HIV transmission questions, most students in both groups already knew that HIV is transmitted through sexual interaction. After the educational game session, more students in the intervention group answered correctly than those in the control group. In addition, the proportion of correct answers in the intervention group increased significantly for all questions pertaining to HIV transmission, except for mother-to-child transmission during pregnancy. There was a 1.3-fold increase in the proportion of correct responses regarding transmission from mother to child during pregnancy, with a *p value* close to 0.05 (p=0.06). Meanwhile, most of the correct answers in the control group decreased significantly in the post-test despite not receiving any intervention.

Concerning the prevention of HIV-AIDS, most students in the intervention group answered all questions correctly after the educational game (>80%–100%). In contrast, students' answers in the control group were not significantly changed, except for one question regarding condom use as HIV prevention, which showed a significant decline in percentage. In addition, the proportion of correct responses in the first group indicated a significant increase in the number of people with HIV and HIV-AIDS cure-related issues. In contrast, the replies of the pupils in the second group were unaffected by the educational game.

Given attitudes toward HIV-AIDS, the score before and after the educative game is provided in Table 4. Cronbach's alpha reliability test used to measure attitudes and stigma related to HIV-AIDS was 0.704. As shown in Table 4, there was a significant increase in the total attitude scores in the intervention group, while the score of the control group remained the same ($p < 0.01$ vs $p = 0.4$). Further analysis suggests distinct transformations toward positive attitudes toward HIV among students, such as students with HIV continuing their studies, remaining friends despite their HIV status, and people with HIV not being isolated ($p < 0.05$).

Although not statistically significant, the scores in terms of friends with HIV should not be avoided and the perception that HIV-AIDS is not a curse is higher than before the intervention ($p = 0.06$ and $p = 0.17$, respectively). However, the attitudes of the control group remained identical, except for assertions that students with HIV can continue to study, which increases significantly, and that friends with HIV should not be avoided, which decreases dramatically.

Table 1. Characteristics of Participant

	Intervention Group N = 56	**Control Group N = 56**	**Statistics**
Gender	**Frequency (%)**		
Male	21 (37.5%)	20 (35.7%)	1[a]
Female	35 (62.5%)	36 (64.3%)	
Age	**Median (range)**		
	16 (15-18)	16 (15-18)	0.68[b]
Pretest Knowledge Score	**Median (range)**		
	65 (25-100)	65 (30-90)	0.89[b]
Pretest Attitude Score			
	17 (15-18)	17 (15-19)	0.98[b]

[a]Fisher's exact test was used, significant if $p<0.05$

[b]Mann Whitney Test was used, significant if $p<0.05$

Table 2. Comparison of HIV-AIDS Knowledge Score Before and After Educative Game

	Intervention Group (n=56)			**Control Group (n=56)**			p^3
	Median Score (25^{th}-75^{th})			Median Score (25^{th}-75^{th})			
	Before	After	p^1	Before	After	p^2	
Total Score	65 (55-75)	90 (85-95)	<0.01*	65 (55-70)	65 (55-70)	0.35	<0.01*
Knowledge of HIV Transmission	63.6 (54.5-81.8)	90.9 (81.8-100)	<0.01*	63.6 (54.5-72.7)	63.6 (54.5-72.7)	0.15	<0.01*
Knowledge of HIV Prevention	66.7 (50-83.3)	100 (83-100)	<0.01*	66.7 (50-83.3)	66.7 (50-83.3)	0.96	<0.01*
Knowledge of the Appearance of people with HIV	50 (50-100)	100 (100-100)	<0.01*	50 (50-100)	50 (50-100)	0.84	<0.01*
Knowledge of HIV-AIDS Cure	50 (0-100)	100 (100-100)	<0.01*	50 (0-100)	100 (0-100)	0.41	<0.01*

p^1 and p^2 were calculated using Wilcoxon Signed Rank Test, significant if $p<0.05$

p^3 was calculated using Mann Whitney Test, significant if $p<0.05$

Table 3. Percentage and Comparison of Students' Correct Answer Before and After Educative Game

HIV-AIDS Comprehensive Knowledge (α=0.829)	Percentage of Correct Answer						p^3
	Intervention Group N=56			Control Group N=56			
	Before	After	p^1	Before	After	p^2	
Transmission of HIV							
1. HIV is transmitted through sexual intercourse	100%	100%	NA	98.2%	100%	1	NA
2. HIV is transmitted through shared needle use	89.3%	100%	0.03*	87.5%	94.6%	0.29	<0.01*
3. HIV is transmitted through blood transfusion	83.9%	98.2%	0.02*	83.9%	83.9%	1	0.016*
4. HIV is transmitted from mother to child during labor	48.2%	75%	<0.01*	37.5%	37.5%	1	<0.01*
5. HIV is transmitted from mother to child during breastfeeding	55.4%	92.9%	<0.01*	44.6%	39.3%	0.55	<0.01*
6. HIV is transmitted from mother to child during pregnancy	51.8%	69.6%	0.06	39.3%	33.9%	0.45	<0.01*
7. HIV is transmitted through buying food from HIV (+) person	64.3%	94.6%	<0.01*	64.3%	60.7%	0.75	<0.01*
8. HIV is transmitted through eating one plate with HIV (+) person	39.3%	64.3%	<0.01*	42.9%	39.3%	0.69	0.014
9. HIV is transmitted through eating food prepared by HIV (+) person	62.5%	96.4%	<0.01*	50%	55.45	0.51	<0.01*
10. HIV is transmitted through mosquito	51.8%	80.4%	<0.01*	62.5%	44.6%	0.03*	<0.01*
11. HIV is transmitted through hugging and holding hand	67.9%	96.4%	<0.01*	75%	69.6%	0.45	<0.01*
Prevention of HIV-AIDS							
12. HIV-AIDS can be prevented by having one sexual partner only	71.4%	92.9%	<0.01*	64.3%	69.6%	0.55	0.003*
13. HIV-AIDS can be prevented by having sexual relationship with husband or wife only	78.6%	91.1%	0.06	67.9%	71.4%	0.69	0.014*
14. HIV- AIDS can be prevented by abstinence	57.1%	80.4%	<0.01*	69.6%	66.1%	0.79	0.135
15. HIV-AIDS can be prevented by using condom during sexual intercourse	53.6%	100%	<0.01*	62.5%	42.9%	0.01*	<0.01*
16. HIV-AIDS can be prevented by not sharing needle	91.1%	98.2%	0.22*	83.9%	91.1%	0.34	0.206
17. HIV-AIDS can be prevented by having male-circumcision	28.6%	89.3%	<0.01*	30.4%	41.1%	0.07	<0.01*
The appearance of People with HIV							
18. People with HIV can be without symptoms	48.2%	87.5%	<0.01*	50%	48.2%	1	<0.01*

HIV-AIDS Comprehensive Knowledge (α=0.829)	Percentage of Correct Answer						p^3
	Intervention Group N=56			Control Group N=56			
	Before	After	p^1	Before	After	p^2	
19. People with HIV can transmit despite being fit and without symptoms	78.6%	92.9%	0.04*	80.4%	80.45	1	0.094
Existence of HIV-AIDS cure							
20. There is a cure for HIV-AIDS	50%	98.2%	<0.01*	60.7%	64.3%	0.69	<0.01*

p^1 and p^2 were calculated using McNemar Test, significant if $p<0.05$

p^3 calculated using Fisher's Exact Test, significant if $p<0.05$

Table 4. Comparison of Attitudes toward HIV-AIDS Before and After Educative Game

	Intervention Group (n=56)			Control Group (n=56)			p^3
	Mean Score (SD)			Mean Score (SD)			
	Before	After	p^1	Before	After	p^2	
Total Attitude's Score (α=0.704)	16.27 (2.83)	17.84 (2.66)	<0.01*	16.36 (2.69)	16.62 (2.70)	0.40	<0.01*
Positive attitudes that students with HIV can continue their study	3.09 (0.94)	3.66 (0.74)	<0.01*	3.05 (0.90)	3.32 (0.69)	0.01*	<0.01*
Positive attitudes that friends with HIV should not be avoided	3.70 (0.60)	3.84 (0.53)	0.06	3.77 (0.54)	3.64 (0.62)	0.04*	0.014
Positive perception that HIV-AIDS is not curse	3.52 (0.71)	3.64 (0.72)	0.17	3.50 (0.79)	3.48 (0.76)	0.78	0.14
Positive attitudes to stay being friends despite HIV status	3.29 (0.73)	3.52 (0.76)	0.01*	3.38 (0.73)	3.46 (0.74)	0.40	0.60
Positive perception that people with HIV should not be isolated/ quarantined	2.68 (1.05)	3.18 (0.97)	<0.01*	2.66 (0.99)	2.71 (0.93)	0.68	<0.01*

p^1 and p^2 were calculated using Wilcoxon Signed Rank Test, significant if $p<0.05$

p^3 was calculated using Mann Whitney Test, significant if $p<0.05$

DISCUSSION

The use of gamification in health promotion and education is less frequent in Indonesia. However, few game-based learning studies have been conducted in Indonesia before (Edi & Taufik, 2019; Siregar et al., 2018; Yasmin et al., 2020; Zaen et al., 2017). Using board games as an educational method was much more effective in increasing knowledge about HIV and STIs than the lecture method (Wanyama et al., 2012). Another study reported that board games effectively increased participants' knowledge, cognitive function, interpersonal interactions, and motivation (Gauthier et al., 2018; Noda et al., 2019). Therefore, using game-based learning as a health-promoting program targeting adolescent students is an effective and promising approach to be widely implemented to raise awareness of health issues, specifically HIV-AIDS.

This study evaluated game-based learning using the YARSI HIV-AIDS Care Smart Card to determine whether it increased high school students' HIV-related knowledge and positive attitudes toward people living with HIV (reduction of HIV-related stigma). First, the YARSI HIV-AIDS Care Smart Card educational game was found to significantly enhance HIV-related knowledge, which follows previous findings that game-based learning can be used as a health-promotion tool (Siregar et al., 2018; Wanyama et al., 2012; Yasmin et al., 2020; Zaen et al., 2017). Second, the YARSI HIV-AIDS Care Smart Card educational game is the first "True or False" flashcard game in Indonesia, with every card explaining HIV transmission, prevention, cure, myths, and stigma. Therefore, we cannot compare its effects with those of similar studies.

Initially, the YARSI HIV-AIDS Care Smart Card educational game was planned to be played directly by the students. However, owing to the COVID-19 pandemic, data collection and educational games were conducted online. Despite being conducted online and its limitations, the intervention showed significant improvement in HIV-related knowledge and positive attitudes among students before and after the educational game. It was also superior to that of the control group, which did not receive any intervention. However, this study did not evaluate the effect of the educational game method compared to conventional methods, such as lectures or counseling. Therefore, whether the YARSI HIV-AIDS Care Smart Card educational game is more effective than the conventional method for educating students needs to be further determined.

Before the COVID-19 pandemic, most HIV education programs in schools used conventional methods such as lectures or counseling. Despite its effectiveness, its implementation significantly depends on the availability and accessibility of health experts, educators, counselors, and other supporting resources. Therefore, only a few HIV education programs have been implemented in high schools.

Several reproductive health (including HIV-AIDS) promotion programs are organized by the district health office or primary health care and the National Population and Family Planning Agency (Badan Kependudukan dan Keluarga Berencana Nasional, BKKBN). However, their implementation is often unsustainable because of the lack of human resources, time, and funding. Teacher representatives from high schools also regularly receive training to become counselors and receive education on adolescent health and HIV-AIDS. However, in reality, without educational media, these teachers find it difficult to implement training and provide education on reproductive health and HIV-AIDS to their students.

The YARSI HIV-AIDS Care Smart Card as a health promotion medium is a solution because the students (and the newly enrolled students) can always play the game and gain insight. The game can be played independently or guided by other students who have played it before.

Teachers can also use media to educate their students regarding HIV-AIDS transmission, prevention, cure, myths, and stigma in an interactive and engaging approach that shows more significant positive effects than traditional methods (Ding et al., 2017; Liao et al., 2010; Rice et al., 2018).

In addition to increasing knowledge, this game-based learning method also improved students' positive attitudes (reducing stigma) toward people living with HIV. Furthermore, because no similar game-based education method has been used previously, the comparison between our study and other related studies could not be determined per se. However, one meta-analysis revealed that board-game-based education had little to moderate effect on attitude or behavior changes (Gauthier et al., 2018). In contrast, another study by Mak et al.(2017) demonstrated that intervention using an interactive method, such as gamification or roleplay, was not significant in improving attitudes or stigma reduction toward people living with HIV. However, the relatively small sample sizes may account for these nonsignificant findings (Mak WW, Cheng SS, Law RW, Cheng WW, 2015).

Even if increasing knowledge and attitude scores of HIV-AIDS do not necessarily relate to the actual prevention of HIV-AIDS practices, some studies have found a correlation between HIV-AIDS knowledge and behavior change. (Hong et al., 2012; Kesumawati, 2019; Nwokolo et al., 2011; Shewarega et al., 2022; Swenson et al., 2010). With increased knowledge of HIV-AIDS, students were expected to avoid high-risk behaviors related to HIV transmission.

Additionally, there is evidence of knowledge improvement and delay in sexual activity among students after completing the computer game-based sexual health education program in the United States of America (Peskin et al., 2015; Rohrbach et al., 2019). Another report by Mwale and Muula (2017) and Lazarus et al. (2010) found that peer education as an intervention was the most effective method to facilitate HIV risk reduction, which showed great potential if all these methods were used in combination. This combined method could optimize the effectiveness of HIV prevention programs among adolescents; however, this requires further investigation.

Additionally, a greater understanding of HIV-AIDS is associated with a decline in stigma against people with HIV. The findings of our study indicate that an increase in knowledge is accompanied by an increase in positive attitudes (reduced stigma) towards HIV/AIDS. This result confirms the findings of previous research that the level of HIV-AIDS knowledge correlates with stigmatization (Sallam et al., 2022; Sen et al., 2021; Yang et al., 2006). Knowledge reduces the stigma associated with HIV/AIDS (Alemi & Stempel, 2019; Harapan et al., 2013; James & Ryan, 2018; Kusuma et al., 2020; Shah et al., 2020; Youssef et al., 2021).

The drawback of this study was that the sample size was not large enough to generalize the student and non-student adolescent populations. Additionally, there has been no comparison with conventional methods. The intervention was administered only once. Lastly, there was no follow-up test to determine the duration of knowledge and its effects on behavioral changes related to HIV risk due to limited research funding. However, this study served as a pioneer flashcard-game-based education program that needs further development and can be combined with other proven health promotion methods such as peer and online game-based education. With this flashcard-based educational media, the HIV-AIDS promotion program will not be limited to the availability and accessibility of health experts or counselors.

In addition, a transformation from conventional health promotion using face-to-face methods to an online game-based health promotion approach using web or

software development should be initiated in Indonesia. Therefore, HIV-AIDS prevention programs could be implemented in every district and school in Indonesia so that adolescents can learn about HIV-AIDS and other health-related issues more efficiently.

The key to the success of HIV-AIDS prevention programs are continuous and long-term strategies (Kyrychenko et al., 2006; Ungan & Yaman, 2003), which can be achieved using interactive game-based learning media. Both digital and non-digital media, such as flashcard games, board games, computer-based games, and software-based education, should be encouraged to educate students and adolescents regarding HIV-AIDS and other health-related issues. The availability of these learning media to educate adolescents (students) in every high school is expected to help them understand how HIV is transmitted, prevented, and cured; without health experts or HIV-AIDS, counselors must educate them directly. Hence, this learning media could be continuously used by students, generations, and generations, so the long-term goal of the HIV-AIDS promotion program can be achieved more effectively and efficiently.

CONCLUSIONS

This study concludes that employing flashcard-based online educational games to improve HIV-AIDS-related knowledge and reduce stigma against people living with HIV is effective and useful. This gamification method may be more effective in raising awareness and reducing HIV risk behavior if implemented using a peer education approach, upgrading into online or software-based educational games, and long-term strategies.

REFERENCES

Alemi, Q., & Stempel, C. (2019). Association between HIV knowledge and stigmatizing attitudes towards people living with HIV in Afghanistan: Findings from the 2015 Afghanistan Demographic and Health Survey. *International Health*, *11*(6), 440–446. https://doi.org/10.1093/inthealth/ihz013

Ding, D., Guan, C., & Yu, Y. (2017). Game-Based Learning in Tertiary Education: A New Learning Experience for the Generation Z. *International Journal of Information and Education Technology*, *7*(2), 148–152. https://doi.org/10.18178/ijiet.2017.7.2.857

Directorate General of Disease Prevention and Control, M. of H. I. (2018). *Report on the Progress of HIV-AIDS and Sexually Transmitted Infections (STIs) Quarter IV 2017*.

Directorate General of Disease Prevention and Control, M. of H. I. (2019). *Report on the Progress of HIV-AIDS and Sexually Transmitted Infections (STIs) Quarter IV 2018*. Ministry of Health Indonesia. https://doi.org/10.1017/CBO9781107415324.004

Directorate General of Disease Prevention and Control, M. of H. I. (2020). *Report on the Progress of HIV-AIDS and Sexually Transmitted Infections (STIs) Quarter IV 2019*.

Edi, & Taufik, M. (2019). Permainan Ular Tangga Sebagai Media Edukasi Seksualitas Remaja. *Jurnal Endurance : Kajian Ilmiah Problema Kesehatan*, *4*(1), 442–448. https://doi.org/10.22216/jen.v4i2.4280

Gauthier, A., Kato, P. M., Bul, K. C. M., Dunwell, I., Walker-Clarke, A., & Lameras, P. (2018). Board Games for Health: A Systematic Literature Review and Meta-Analysis. *Games for Health Journal*, *8*(2), 85–100. https://doi.org/10.1089/g4h.2018.0017

Harapan, H., Feramuhawan, S., Kurniawan, H., Anwar, S., Andalas, M., & Hossain, M. B. (2013). HIV-related stigma and discrimination: A study of health care workers in Banda Aceh, Indonesia. *Medical Journal of Indonesia*, *22*(1), 22–29. https://doi.org/10.13181/mji.v22i1.518

Hong, S. Y., Thompson, D., Wanke, C., Omosa, G., Jordan, M. R., Tang, A. M., Patta, S., Mwero, B., Mjomba, I., & Mwamburi, M. (2012). Knowledge of HIV transmission and associated factors among HIV-positive and HIV-negative patients in rural Kenya. *Journal of AIDS and Clinical Research*, *3*(7), 1–13. https://doi.org/10.4172/2155-6113.1000170

James, T. G., & Ryan, S. J. (2018). HIV knowledge mediates the relationship between HIV testing history and stigma in college students. *Journal of American College Health*, *66*(7), 561–569. https://doi.org/10.1080/07448481.2018.1432623

Kesumawati, K. A. S. (2019). Hubungan pengetahuan remaja tentang hiv/aids dengan perilaku seksual remaja di smk mutiara kota bandung. *Journal of Midwifery and Public Health*, *1*(2). https://doi.org/10.25157/jmph.v1i2.3004

Kusuma, M. T. P. L., Kidd, T., Muturi, N., Procter, S. B., Yarrow, L., & Hsu, W.-W. (2020). HIV knowledge and stigma among dietetic students in Indonesia: implications for the nutrition education system. *BMC Infectious Diseases*, *20*(1), 663. https://doi.org/10.1186/s12879-020-05379-8

Kyrychenko, P., Kohler, C., & Sathiakumar, N. (2006). Evaluation of a School-Based HIV/AIDS Educational Intervention in Ukraine. *Journal of Adolescent Health*, *39*(6), 900–907. https://doi.org/10.1016/j.jadohealth.2006.06.006

Liao, Y., Chang, L. E., & Chang, C.-C. (2010). Game-based Learning vs. Traditional Instruction: A Meta-Analysis of Thirty-Eight Studies from Taiwan. *Technology and Teacher Education Annual Vo - Conf 21, March 2010*, 1491.

Mak, W. W. S., Mo, P. K. H., Ma, G. Y. K., & Lam, M. Y. Y. (2017). Meta-analysis and systematic review of studies on the effectiveness of HIV stigma reduction programs. *Social Science and Medicine*, *188*, 30–40. https://doi.org/10.1016/j.socscimed.2017.06.045

Mak WW, Cheng SS, Law RW, Cheng WW, C. F. (2015). Reducing HIV-related stigma among health-care professionals: A game-based experiential approach. *AIDS Care - Psychological and Socio-Medical Aspects of AIDS/HIV*, *27*(7), S46–S56. https://doi.org/10.1080/09540121.2015.1007113

Ministry of Health Indonesia. (2013). *Indonesia Demographic and Health Survey 2012 Statistics Indonesia National Population and Family Planning Board Ministry of Health MEASURE DHS ICF International*. 1–544.

Ministry of Health Indonesia. (2019). *Indonesia Health Profile 2018* (R. Kurniawan, Yudianto, B. Hardhana, & T. Siswanti (eds.)). Ministry of Health Indonesia.

Mwale, M., & Muula, A. S. (2017). Systematic review: A review of adolescent behavior change interventions [BCI] and their effectiveness in HIV and AIDS prevention in sub-Saharan Africa. *BMC Public Health*, *17*(1), 1–9. https://doi.org/10.1186/s12889-017-4729-2

National Institute of Health Research and

Development. (2010). Baseline Health Research 2010. In *Ministry of Health Indonesia*.

Noda, S., Shirotsuki, K., & Nakao, M. (2019). The effectiveness of intervention with board games: a systematic review. *BioPsychoSocial Medicine*, *13*(1), 22. https://doi.org/10.1186/s13030-019-0164-1

Nwokolo, C., Anyamene, A., Anyachebelu, E., & Obum-Okeke, I. (2011). Influence of the knowledge of HIV/AIDS on behaviour change among adolescents in Anambra State, Nigeria. *International Journal of Psychology and Counselling*, *3*(8), 154–158.

Peskin, M., Shegog, R., Markham, C., Thiel, M., Baumler, E., Addy, R., Gabay, E., & Emery, S. (2015). Efficacy of It's Your Game-Tech: A Computer-Based Sexual Health Education Program for Middle School Youth. *J Adolesc Health*, *56*(5), 515–521. https://doi.org/10.1016/j.jadohealth.2015.01.001

Rice, N. C., Guru, A., Keeler, C. N., Keshwani, D. R., & Keshwani, J. (2018). Comparison of game-based learning and traditional lecture approaches to improve student engagement and knowledge transfer in STEM education. *ASEE Annual Conference and Exposition, Conference Proceedings*, *2018-June*. https://doi.org/10.18260/1-2--30209

Rohrbach, L. A., Donatello, R. A., Moulton, B. D., Afifi, A. A., Meyer, K. I., & De Rosa, C. J. (2019). Effectiveness Evaluation of It's Your Game: Keep It Real, a Middle School HIV/Sexually Transmitted Infection/Pregnancy Prevention Program. *Journal of Adolescent Health*, *64*(3), 382–389. https://doi.org/10.1016/j.jadohealth.2018.09.021

Sallam, M., Alabbadi, A. M., Abdel-Razeq, S., Battah, K., Malkawi, L., Al-Abbadi, M. A., & Mahafzah, A. (2022). HIV Knowledge and Stigmatizing Attitude towards People Living with HIV/AIDS among Medical Students in Jordan. *International Journal of Environmental Research and Public Health*, *19*(2), 1–15. https://doi.org/10.3390/ijerph19020745

Saputra, G. (2008). *GAMBARAN PENGETAHUAN SIKAP DAN PERILAKU TERKAIT HIV AIDS PADA SISWA KELAS 3 SMA PGRI 1 KOTA BOGOR TAHUN 2008*. Universitas Indonesia.

Sen, L. T., Hutauruk, P. M. S., Putra, M. R. A., Maulida, S. B., Ramadhan, A., & Sugiharto, A. (2021). Scrutinizing the knowledge and stigma of HIV/AIDS in the community level in Indonesia and the correlation to risk groups aversion to screening. *IOP Conference Series: Earth and Environmental Science*, *716*(1). https://doi.org/10.1088/1755-1315/716/1/012089

Shah, S., Elgalib, A., Al-Wahaibi, A., Al-Fori, M., Raju, P., Al-Skaiti, M., Al-Mashani, H. N., Duthade, K., Omaar, I., Muqeetullah, M., Mitra, N., Shah, P., Amin, M., Morkos, E., Vaidya, V., Al-Habsi, Z., Al-Abaidani, I., & Al-Abri, S. S. (2020). Knowledge, Attitudes and Practices Related to HIV Stigma and Discrimination Among Healthcare Workers in Oman. *Sultan Qaboos University Medical Journal*, *20*(1), e29–e36. https://doi.org/10.18295/squmj.2020.20.01.005

Shewarega, E. S., Fentie, E. A., Asmamaw, D. B., Negash, W. D., Fetene, S. M., Teklu, R. E., Aragaw, F. M., Alemu, T. G., Eshetu, H. B., & Belay, D. G. (2022). Sexually transmitted

infections related care-seeking behavior and associated factors among reproductive age women in East Africa: a multilevel analysis of demographic and health surveys. *BMC Public Health*, *22*(1), 1–11. https://doi.org/10.1186/s12889-022-14120-w

Siregar, P. D., BM, S. H., & Indraswari, R. (2018). Evaluasi Efektivitas Permainan Ular Tangga Hiv/Aids Terhadap Peningkatan Pengetahuan Tentang Hiv/Aids Pada Siswa Sma Di Kota Semarang. *Jurnal Kesehatan Masyarakat (e-Journal)*, *6*(2), 170–178.

Swenson, R. R., Rizzo, C. J., Brown, L. K., Vanable, P. A., Carey, M. P., Valois, R. F., DiClemente, R. J., & Romer, D. (2010). HIV knowledge and its contribution to sexual health behaviors of low-income African American adolescents. *Journal of the National Medical Association*, *102*(12), 1173–1182. https://doi.org/10.1016/S0027-9684(15)30772-0

Ungan, M., & Yaman, H. (2003). AIDS knowledge and educational needs of technical university students in Turkey. *Patient Education and Counseling*, *51*(2), 163–167. https://doi.org/10.1016/S0738-3991(02)00190-8

Wanyama, J. N., Castelnuovo, B., Robertson, G., Newell, K., Sempa, J. B., Kambugu, A., Manabe, Y. C., & Colebunders, R. (2012). A randomized controlled trial to evaluate the effectiveness of a board game on patients' knowledge uptake of HIV and sexually transmitted diseases at the Infectious Diseases Institute, Kampala, Uganda. *Journal of Acquired Immune Deficiency Syndromes (1999)*, *59*(3), 253–258. https://doi.org/10.1097/QAI.0b013e31824373d5

Yang, H., Li, X., Stanton, B., Fang, X., Lin, D., & Naar-King, S. (2006). HIV-related knowledge, stigma, and willingness to disclose: A mediation analysis. *AIDS Care*, *18*(7), 717–724. https://doi.org/10.1080/09540120500303403

Yasmin, I. F., Putra, D. A., Fristka, L., Lihartanadi, J., Biondi, M., Sari, A. K., Laurent, A., & Christiani. (2020). The effect of educative games by peer-group on knowledge of reproductive health, HIV-AIDS, and drug abuse Title. *Berita Kedokteran Masyarakat*, *36*(8). https://doi.org/https://doi.org/10.22146/bkm.56839

Youssef, L., Hallit, S., Sacre, H., Salameh, P., Cherfan, M., Akel, M., & Hleyhel, M. (2021). Knowledge, attitudes and practices towards people living with HIV/AIDS in Lebanon. *PLoS ONE*, *16*(3 March), 1–15. https://doi.org/10.1371/journal.pone.0249025

Zaen, N. L., Asfriyanti, & Tukiman. (2017). Pengaruh Simulasi Permainan Ular Tangga Genre Terhadap Pengetahuan Dan Sikap Remaja Tentang Triad Krr (Seksualitas, Hiv Dan Aids, Napza) Di Smpn 1 Tanjung Morawa Tahun 2016. *JURNAL STIKNA Jurnal Sains, Teknologi, Farmasi & Kesehatan*, *01*(02), 148–157.