

The influence of community-level digital health interventions by peer educators on HIV/AIDS prevention among adolescents: A scoping review

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Abstract

Timely identification of HIV is crucial for mitigating transmission and enhancing treatment efficacy. Information and communication technology and digital media advancement have become integral to adolescent's daily lives. Platforms, including social media, instant messaging applications, and websites, offer novel avenues for disseminating health information, particularly on HIV/AIDS prevention. The peer educator model and digital media provide more interactive, personalized, and targeted dissemination of health messages. This study encompasses original research published in English, adhering to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) guidelines. The search utilized Scopus, Science Direct, Pubmed, Medline, and Google Scholar data, covering selected publications from 2019 to 2024 during the last five years. The most notable rise transpired among the youngest demographic, specifically those aged 13 to 14, with an average knowledge increase of about 18%. Adolescents exposed to sexual and reproductive health education via peer discussion groups possessed superior awareness about HIV compared to those who were not exposed. Enhanced comprehension among students in the intervention group of HIV/AIDS, its transmission, and prevention methods. The control group students' knowledge did not improve during the post-test. The extent of peer educator engagement in HIV/AIDS knowledge among adolescents who received digital media intervention showed a significant increase of 1.90 times relative to the group that did not get such intervention ($p < 0.00001$). The digital media intervention markedly enhanced peer educator engagement in HIV/AIDS awareness among adolescents. Digital media-based HIV screening initiatives are essential to improve access to HIV/AIDS information services.

Keywords: Adolescent; Digital health; Peer Educator; HIV/AIDS

1. Introduction

Enhancing health and well-being across all age groups is a primary objective outlined in the Sustainable Development Goals (SDGs) 2030 agenda. HIV and AIDS remain significant global public health issues, particularly threatening the adolescent demographic. The international problem presented by the Human Immunodeficiency Virus (HIV) remains a considerable concern. UNAIDS statistics estimate that approximately 630,000 individuals will succumb to Human Immunodeficiency Virus (HIV) infections, while 1.3 million will contract HIV/AIDS in 2023. Some 360,000 persons aged 15 to 24 globally are infected with HIV, including 140,000 adolescents aged 15 to 19 [1].

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A new HIV infection can only be identified by testing. Timely identification of HIV is essential for mitigating its transmission and enhancing the efficacy of HIV treatment. Early detection of HIV facilitates prompt treatment, thereby controlling the infection and averting its progression to AIDS [2]. HIV/AIDS awareness is crucial for teenagers to prevent new HIV infections. The health promotion program incorporating sex education for teenagers should be designed following prevailing social, cultural, and religious norms to mitigate harmful reproductive health behaviors [3]. A prior study indicates that advanced age, marital status, education, and significant money correlate with more extensive knowledge [4]. Nevertheless, numerous teens continue to lack knowledge [5]. Moreover, numerous individuals continue to harbor misconceptions regarding HIV transmission and the gravity of the associated stigma [6]. Health education regarding HIV/AIDS among peers might enhance adolescent's knowledge and awareness of transmission methods and prevention strategies [7].

Adolescents undergo a transitional phase that renders them susceptible to engaging in dangerous behaviors, including unsafe sexual practices. Insufficient comprehension of HIV/AIDS and inadequate prevention strategies are primary contributors to the rise of new infections among teenagers [8]. Moreover, conventional methods of HIV/AIDS preventive efforts frequently prove inadequate in engaging this demographic. Adolescents are generally more receptive to information their peers communicate, who share emotional and cultural affinities. Peer education strategies have demonstrated efficacy in disseminating health messages to teenagers. This strategy facilitates adolescent's openness and comfort in discussing topics frequently deemed taboo, such as HIV/AIDS and reproductive health [9].

Timely identification of HIV is crucial for minimizing transmission and enhancing treatment efficacy. Early detection of HIV facilitates prompt initiation of treatment, thereby managing the virus and averting its advancement to AIDS. A thorough understanding of HIV/AIDS is crucial for teenagers to prevent new infections. Health promotion initiatives focusing on adolescent sex education must be customized to align with local social, cultural, and religious norms to mitigate hazardous reproductive behaviors. Prior research indicates that advanced age, marital status, elevated education, and improved economic circumstances correlate with enhanced understanding. Nonetheless, numerous adolescents remain deficient in sufficient knowledge. Furthermore, numerous individuals continue to misinterpret HIV transmission and the repercussions of the associated stigma. Adequate understanding of HIV/AIDS correlates with teenagers' desire to engage in HIV preventive behaviors [10].

Digital healthcare possesses significant potential in the 5.0 era due to its flexibility and extensive reach [11]. Technology is closely associated with the youth demographic. Consequently, digital health literacy, particularly in the context of avoiding HIV transmission among teenagers through autonomous teaching and screening, presents a significant opportunity. Digital healthcare is encompassed within self-care initiatives (WHO, 2021). With the advancement of information and communication technology, digital media has become essential to adolescent's daily lives. Platforms, including social media, instant messaging applications, and websites, offer novel avenues for disseminating health information, particularly HIV/AIDS prevention [12]. Integrating the peer educator model and digital media facilitates more participatory, personalized, and targeted health communications. Prior studies have demonstrated that peer education effectively utilizes social influence theory, resulting in enduring behavioral changes in high-risk HIV populations globally, particularly in low-and middle-income nations. Peer educators can decrease the prevalence of HIV in at-risk populations by 36% and facilitate the promotion of HIV testing [13].

For many young adults who are HIV-positive, employing digital-based HIV care navigation helps mitigate inequities in accessing and maintaining care while improving their overall engagement in HIV treatment. It can fulfill multiple functions, such as directing individuals in HIV care, disseminating health promotion and education, executing motivational interviews, and offering social support [14]. A separate study indicated that interactive digital interventions positively influenced sexual health promotion and enhanced knowledge, intentions, and actions about HIV prevention [15, 16].

Therefore, we performed a scoping review to deliver a more thorough assessment of the efficacy of digital interventions in enhancing teenage participation in HIV prevention strategies and to formulate recommendations for designing peer educator-based digital campaigns that effectively engage and positively impact adolescents.

2. Material and methods

The approach and principles utilized in this scoping review are based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses)-ScR framework established by Tricco et al. [17].

2.1. Protocol and registration

The authors did not establish a review protocol or registration for this topic per PROSPERO guidelines.

2.2. Eligibility criteria

The literature encompassed a global scope, not restricted to developing nations; the publications were published within the last five years, specifically from 2019 to 2024, in selected journals. The data search occurred in September 2024. The criteria for inclusion are as follows: Research on the Impact of Community-Level Peer Educators using Digital Media on HIV/AIDS Prevention Among Adolescents and Open Access. This research utilized exclusively academic articles published in the English language. Editorials, opinion articles, and correspondence to the editor were omitted.

2.3. Information sources

The scoping review approach examines publications concerning the impact of community-level peer educators via digital media on HIV/AIDS prevention among adolescents undertaken under PRISMA. The search is derived from Scopus, Science Direct, PubMed, MEDLINE, and Google Scholar data. The search emphasizes delivering interventions to teenage peer groups using developed digital health resources. The methodology is formulated with keywords devoid of research design filters. Furthermore, article references are meticulously curated to identify pertinent ones.

2.4. Search strategy

Two reviewers (NO and NS) screened the publications. The screening was conducted in multiple phases, including identifying keywords across five databases, selecting relevant titles and abstracts, and the assessment of full-text availability and its compliance with established inclusion criteria. Reconciliation can significantly influence the accuracy of the abstract screener's decisions at every phase of the screening process [18].

Both authors (NO and NS) independently examined titles and abstracts to find potentially pertinent papers. Abstracts failing to satisfy the inclusion criteria will be excluded. The abstract specifies the article's eligibility for consideration. The two authors determined Article inclusion by consensus, and all exclusion rationales were documented and subsequently categorized as disputes. Discussions persisted until the conflict was settled.

Table 1 Illustrates the search strategy used for this scoping review

Database	Scopus, Science Direct, Pubmed, MEDLINE, and Google Scholar
Other sources	None
Key searched terms	(adolescent), (teen), (teenage), (immature), (not yet adult), (puberty), (teenaged), (young person), (youth), (youthful), (peer education), (peer educator), (digital health), (telehealth), (digital health), (digital media), (digital health), (digital technology), (e-sexual health), (telemedicine), (prevention HIV/AIDS), (rejection HIV/AIDS), (deterrence HIV/AIDS)
Language	English
Location	Globally
Type of publication	September 2019 to September 2024
Exclusion criteria	Editorial, literature review, opinion pieces, letter to the editor, research protocols, study protocols, books, book chapters, needs frameworks, features.

2.5. Selection of sources of evidence

The selection of evidence sources was carried out through five screening phases. The initial phase sought to eliminate redundancies. The second stage confirmed the population's relevance to the study, while the third stage entailed screening based on the article title. The fourth stage concentrated on evaluating the article's abstract. The fifth stage entailed an evaluation of the complete text of the article.

2.6. Data charting process

Personal and professional biases were mitigated by requiring all authors to review the chosen publications and conduct data extraction separately. Data were methodically extracted utilizing a graphing table. The extracted data encompassed the strategies employed, the subject matter, and the support requirements of peer educators in augmenting knowledge about HIV/AIDS among adolescents using technology for health-related objectives.

2.7. Synthesis of result

All data were organized into distinct charting tables, facilitating a systematic study of the acquired information. Upon completion of data extraction for each individual, the charting tables were amalgamated into a singular main table. Discrepancies regarding the extracted data were addressed via email exchanges with the entire study team. The principal author removed superfluous data, encapsulated the findings, and integrated the results.

3. Results

According to Figure 2, among the eight selected articles, two originate from each of three continents, predominantly from Africa (South Africa, Ethiopia, Nigeria, Uganda), with one from Asia (Indonesia), one from America (New York), and one from Europe (Czech Republic).

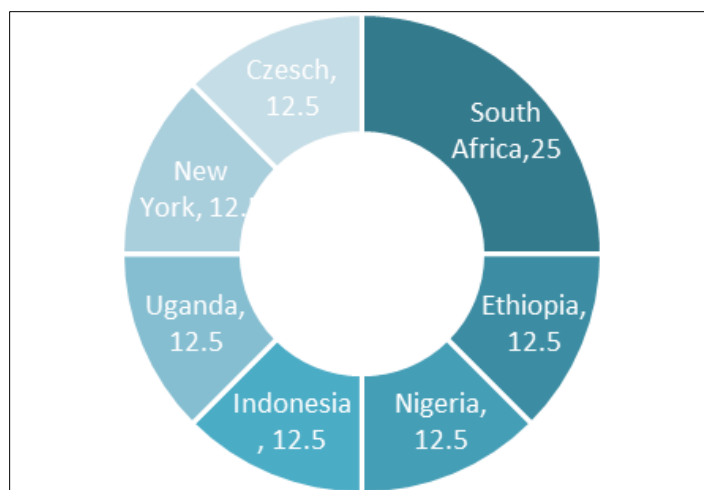


Figure 1 Characteristics of articles based on country

Among the eight articles, four are qualitative, two are quantitative, and two employ mixed methods. The eight articles demonstrate that peer education enhances student's comprehension of HIV, encompassing prevention and transmission.

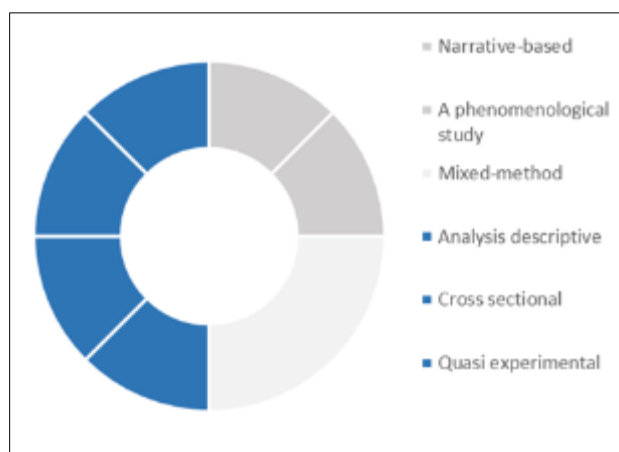


Figure 2 Characteristics of articles based on research design

The database search produced 120 potential sources of evidence. The initial exclusion phase, predicated on duplication, decreased the item count to 110. Out of the 110 papers, 85 were eliminated in the second round of exclusion due to their concentration on populations outside of community or adolescent settings or because they encompassed an unsuitable age range (15–17 years).

Of the remaining 35 articles, a third round of exclusion was conducted based on their titles, resulting in the removal of seven papers that either concentrated exclusively on the efficacy of technological tools or did not conform to the review's criteria, including systematic reviews, literature reviews, and fast reviews. This resulted in 28 articles for the subsequent round of exclusion. The fourth round involved the evaluation of article abstracts, resulting in the exclusion of 20 articles that concentrated on measurement instruments, HIV/AIDS testing trials, technological efficacy, research methodologies, scholarly essays, cost-effectiveness analyses of technology, technology design development, or review articles, thereby yielding a total of 8 articles for the final exclusion round. Following comprehensive consideration, the fifth and final phase resulted in eight articles being completed for this scoping review.

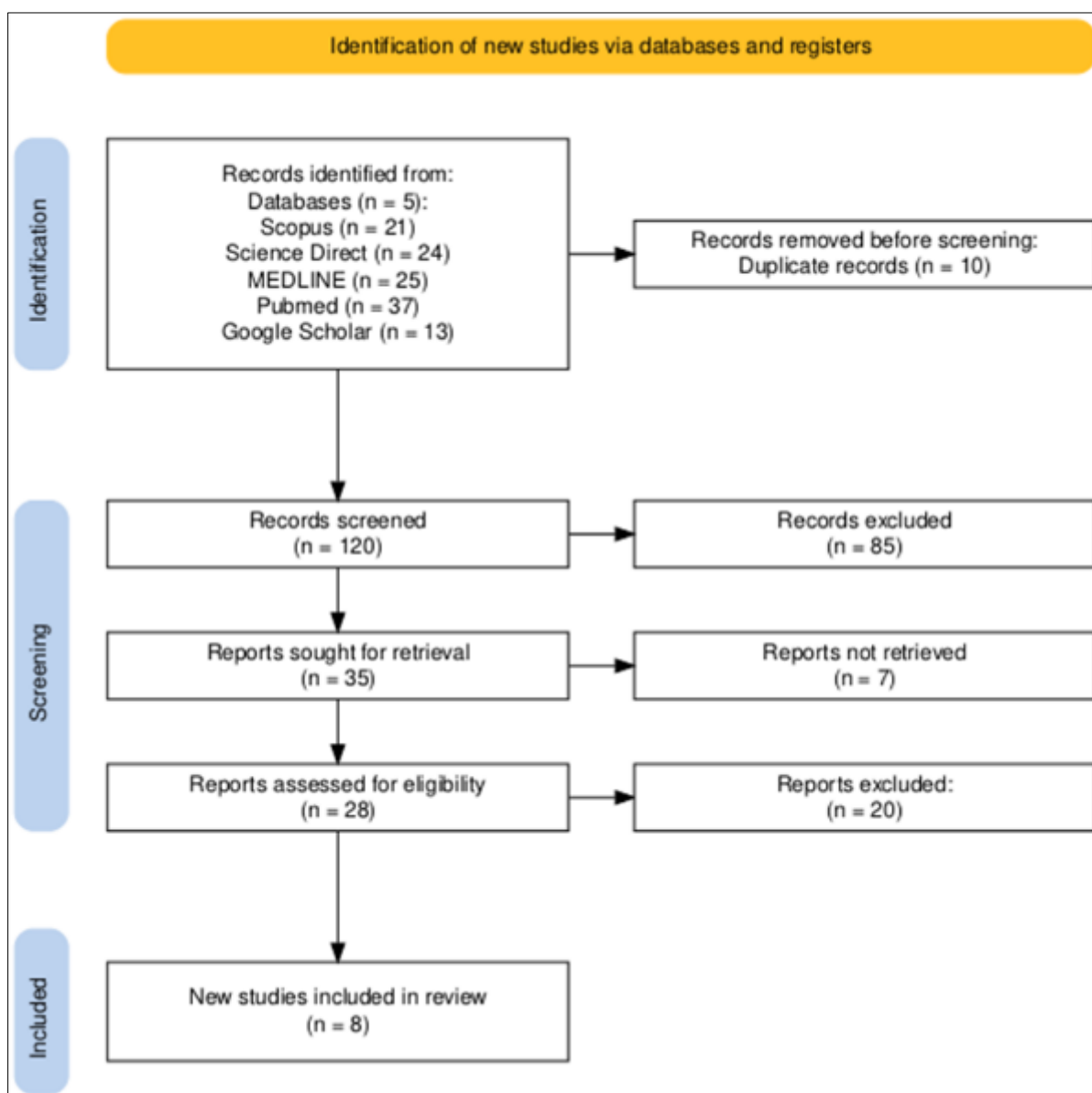


Figure 3 Illustrates the search strategy used for this scoping review

Table 2 Result of data extraction

Author(s)	Study Design	Participants	Intervention	Outcome	Database
Baron et al (2020)	Qualitative, narrative-based	Adolescent females aged 16 to 24 years in South Africa and Tanzania	Peer support groups use an empowerment curriculum to consistently promote the utilization of pre-exposure prophylaxis (PrEP) in HIV prevention.	This intervention seeks to increase knowledge of gender-based violence (GBV), strengthen communication skills, offer emotional support, and promote adherence to PrEP usage.	PubMed
Fasil, N et al (2022)	Cross-sectional study	Adolescent girls aged 13 to 17 reside in rural regions of the West Hararghe Region, Eastern Ethiopia, including 3,290 individuals.	This study's intervention involves delivering sexual and reproductive health education via peer group conversations, encompassing information on HIV, including its transmission, prevention, and treatment.	The primary outcome assessed is extensive knowledge about HIV, encompassing comprehension of prevention and transmission techniques. The research findings indicate that adolescent females who participated in peer group conversations on sexual and reproductive health possess superior HIV awareness compared to their unexposed counterparts.	Scopus
Ezelote et al (2024)	Quasi experimental	The research was performed on adolescents aged 15 to 19 in two schools located in Imo State.	The intervention group received instruction from trained peer educators employing several interactive pedagogical techniques. Peer educators received educational materials for distribution following the session.	Peer education enhances pupils' understanding of HIV, whereas the control group exhibited little advancement.	PubMed
Diah Ratnawati et al (2024)	A phenomenological qualitative study	Adolescents in South Jakarta, Indonesia, who participated in the Generation Planning (GenRe)	The intervention consisted of peer education delivered by GenRe ambassadors to their colleagues regarding HIV/AIDS prevention.	The study results indicated an enhancement in HIV/AIDS prevention behaviors among adolescents,	Google Scholar

		program as ambassadors were included in the study.		encompassing increased knowledge, improved attitudes, and modifications in hazardous behaviors attributable to peer education.	
Namuwonge et al (2024)	Cluster Randomized Control Trial	The research encompassed 1,260 adolescent females aged 14 to 17 in southwestern Uganda.	The two implemented interventions were an economic program and family enhancement via Multiple Family Groups (MFG).	This study evaluates the correlation between peer pressure and hazardous behaviors, including substance use and the susceptibility to sexually transmitted illnesses. It analyzes the impact of peer pressure on intervention results.	Science Direct
Adeagbo et al (2021)	Qualitative approach with an interpretative approach	Adolescent females and males aged 18-29 years in rural KwaZulu-Natal, South Africa, who are at risk of HIV infection.	A cohort of individuals aged 18-30 underwent two weeks of health promotion, peer counseling, and health education training. They were exposed to the "theta Nami" application to deliver education and interventions to teenagers. Trained peer educators will instruct their counterparts.	This study seeks to evaluate a peer-led HIV self-testing paradigm to improve teenagers knowledge and awareness of HIV testing, treatment, and prevention. The research employs a peer methodology, wherein trained peer navigators disseminate information.	PubMed
Macounova et al (2021)	Analysis descriptive	The research encompassed 1,264 students from 457 educational institutions in the Moravian-Silesian area of the Czech Republic.	All regional schools were solicited to engage in an instructional program comprising games and collaborative work.	The study seeks to enhance understanding of sexual education and HIV prevention among teenagers aged 13 to 14.	PubMed
Navarra et al, (2023)	An exploratory sequential mix-method design	Participants consisted of English-speaking HIV-positive adolescents and young adults (AYA) aged 16-29 years who were either behaviorally or perinatally	This research encompassed a mobile health intervention consisting of 78 peer-led videoconferencing sessions for 16 participants utilizing cell phones and the WebEx platform.	Participants indicated that it was beneficial for them to consolidate their understanding of HIV, the correlation between CD4 T-lymphocyte counts and HIV viral load, as well as the function	PubMed

		infected and exhibited unsuppressed plasma HIV RNA levels.		of antiretroviral therapy (ART).	
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3.1.1. Utilizing Digital Technology to Augment HIV Awareness via a Peer-Led Intervention

The Adherence Connection for Counseling, Education, and Support (ACCESS) study sought to evaluate the feasibility and efficacy of a peer-led, mobile health (mHealth) cognitive behavioral intervention (CBI) administered remotely by videoconferencing on smartphones. Individuals aged 16 to 29 years attended five weekly sessions, each lasting 60 minutes, aimed at enhancing adherence to HIV therapy. The sessions were done via WebEx on cellphones given for the study, enabling participants to engage in private environments.

After the intervention, 15 of the 16 participants offered feedback. More than fifty percent of the participants reported that Session 3 was the most beneficial. This session included the Heart to Heart Project educational video, "Understanding HIV Basics," which elucidated the correlation between CD4 T-lymphocyte counts, HIV viral load, and the function of ART in infection management. The film enhanced their comprehension of the significance of adherence, aiding participants in grasping the biological mechanisms underlying their treatment. The digital dissemination of educational content was highly regarded, with participants indicating that it enhanced their comprehension of HIV.

Participants valued the adaptability of the digital format, enabling them to obtain help in private, comfortable settings while benefiting from the organized, peer-led sessions. The responses offered significant insights regarding the efficacy and acceptability of digital technologies in HIV care for adolescents [19].

3.1.2. Experiences of HIV Prevention Peer Support Group Sessions

The study participants exhibited diverse attendance levels at the club meetings, from none to six. Of the 13 respondents, eight participated in all four curriculum sessions, while six engaged in additional sessions post-curriculum, resulting in five to six sessions. Each meeting had two to ten ladies. Attendees reported satisfaction with both the material and the participatory method. A participant shared sentiment by emphasizing that the clubs provided a safe space to discuss personal issues openly. The club meetings fostered a sense of freedom and trust, enabling members to speak about challenges. In this environment, the group felt more like friends than strangers, as the anonymity among members created a unique bond. A sense of confidence emerged, knowing that personal lives and shared experiences remained confidential within the group. This security atmosphere made the clubs invaluable, allowing open discussion without fear of judgment or exposure.

Nonetheless, participation in club sessions was challenging for most attendees owing to their daytime classes and additional obligations. The sessions were typically arranged to align with study clinic appointments to reduce scheduling conflicts. Participants voiced concerns that this led to extended clinic visits. In response, Saturday club sessions were implemented, strategically designed to circumvent weekends when individuals received their wages, thus enhancing attendance [20].

Although the clubs were designed for participants to advance together through four sessions, some women switched groups due to scheduling issues. This approach seemed to weaken the unity of the groups and create anxiety for those who preferred to stay with their original teams, primarily when strong connections, trust, and friendships had already been formed.

3.1.3. The Determinants of Knowledge Regarding HIV Prevention Among Disseminated Peer Educators

The research utilized data from a cross-sectional survey linked to an implementation project conducted in the Western Hararghe Zone of the Oromia Region in Ethiopia. This study involved training leaders from peer groups on a Sexual and Reproductive Health (SRH) module to foster discussions on these essential topics during girls' club meetings. The comparison group for the study comprised adolescent girls who were not part of the intervention's peer groups, as well as girls from a designated control area.

In total, 3,290 adolescent females participated in the research, resulting in a high response rate of 96.2%. Notably, a significant portion of the respondents had never been married (90.65%), and over half reported having a primary school education (54.83%). Additionally, a large majority identified as Muslim (87.77%). When inquired about methods to prevent HIV, 67.1% correctly recognized that maintaining a single uninfected partner can effectively reduce the risk of

HIV transmission. In contrast, 28.44% acknowledged that regular condom usage can similarly mitigate this risk. Concerning misunderstandings about HIV, participants correctly responded to inquiries on the transmission of the virus through mosquito bites or the sharing of food with an individual diagnosed with AIDS. A weighted mixed-effect logistic regression analysis revealed significant insights regarding adolescent females and their knowledge of HIV. Notably, those who participated in sexual and reproductive health education through peer-group discussions exhibited 36% higher odds of acquiring comprehensive knowledge about HIV compared to their peers who were not involved in such conversations [21].

Additionally, it was found that girls who attended secondary school had odds 3.89 times greater of possessing in-depth knowledge about HIV compared to those who had never attended school. Furthermore, older teenagers demonstrated 1.73 times greater odds of having complete HIV information when compared to their younger counterparts. Despite these findings, it is concerning that only 14.84% of young adolescents in rural eastern Ethiopia have a comprehensive understanding of HIV. Participation in peer-group conversations on sexual and reproductive health education was strongly associated with elevated levels of comprehensive knowledge, especially among older teenage girls and those enrolled in secondary education.

The comprehensive understanding of HIV was 16.78% among individuals exposed to SRH education via peer-group conversations, in contrast to 14.01% among those not exposed. In all, 14.84% of adolescent girls exhibited thorough awareness about HIV. A subanalysis of several age cohorts indicated that knowledge among girls aged 13–14 was 12.75%, but it was 17.11% among those aged 15–17.

3.1.4. Enhanced Comprehensive Understanding of HIV Among Adolescents

The research was conducted using Akwakuma Girls Secondary School (AGSS) as the experimental group, while the Federal Government Girls College Owerri (FGGC) served as the control group. These groups were selected randomly without replacement. The study unfolded in three distinct phases: pre-intervention, intervention, and post-intervention. During the intervention phase, a group of 30 students from AGSS participated in a two-week training program to become peer educators [7].

The investigation evaluated students' knowledge of AGSS before and after the intervention. At the outset, their comprehension of HIV, encompassing its concepts, transmission, and prevention, was superficial across all 18 questionnaire items. In the pre-test, only 38 respondents (12.8%) correctly identified that HIV is not transmitted through coughing or sneezing; however, this number rose to 183 (85.1%) in the post-test. Similarly, 52 respondents (17.6%) initially understood that sharing a glass of water with someone who is HIV-positive does not transmit the virus, a figure that later increased to 174 (80.9%). The misconception that withdrawal before ejaculation decreases HIV transmission was acknowledged as incorrect by 101 individuals (34.1%) in the pre-test, which rose to 189 individuals (87.9%) following the intervention. Initially, 56 individuals (18.9%) recognized anal sex as a mechanism of HIV transmission; however, this figure increased to 149 (69.3%) following the intervention. Furthermore, the awareness that washing after sexual intercourse does not protect against HIV rose from 24% to 123 (57.2%). Ultimately, the awareness that HIV-positive patients may not exhibit severe symptoms immediately increased from 21.6% to 57.7% following the intervention.

Prior to the intervention, merely 3.7% of participants recognized that no vaccine exists to protect adults from acquiring HIV; this awareness increased to 63.3% subsequently. Initially, just 29 (9.8%) of the adolescents refuted the idea that deep kissing may transmit HIV; however, this figure rose to 172 (80.0%) following the intervention. Concerning the fallacy that HIV can be transmitted through a hot tub or swimming pool, only 25 individuals (8.4%) responded accurately before the intervention, but this figure increased to 176 individuals (81.9%) subsequently. Before the intervention, awareness of the potential for HIV transmission by oral intercourse was a mere 4.4%, which subsequently rose to 83.7% post-intervention. Moreover, just 32 people (10.8%) recognized that using Vaseline or baby oil alongside a condom does not reduce the risk of HIV, a number that increased to 140 people (65.1%) after the intervention.

The data analysis revealed a substantial enhancement in knowledge among respondents following the peer health education intervention, illustrating its beneficial impact on their comprehension of HIV/AIDS. In contrast, the research assessed the control group (FGGC Owerri), which, at the outset, had a fair comprehension of HIV transmission and prevention. A post-test indicated no enhancement in knowledge for the 184 students who scored 33.3% or less.

Kawuki et al. conducted a study assessing the comprehensive knowledge of HIV/AIDS and related factors among adolescent females in Rwanda. Data from the 2020 Rwanda Demographic and Health Survey showed that 53.6% of the 3,258 teenage girls surveyed demonstrated a thorough understanding of HIV/AIDS. Factors correlated with enhanced

awareness encompassed secondary education, possession of health insurance, ownership of a mobile phone, exposure to television, and prior experience with HIV testing. Simultaneously, residing in particular areas like Kigali and identifying as Protestant correlated with diminished knowledge levels [22].

This study underscores the necessity of broadening access to HIV/AIDS education via formal curricula and public media to improve teenagers' comprehension from an early age. The participation of religious and community leaders is seen as essential in advancing HIV/AIDS preventive knowledge.

3.1.5. Initiatives to Enhance HIV/AIDS Preventive Practices

The study participants consisted of 19 ambassadors from GenRe who examined their attributes and experiences in fulfilling their role to enhance teenagers' HIV/AIDS prevention behaviors. In Indonesia, the Planning Generation Program (GenRe), managed by the National Population and Family Planning Agency (BKKBN), utilizes peer educators known as GenRe ambassadors to encourage teenagers to promote life skills and reproductive health [23].

The participant's remarks, aggregated into a unified data set, underscored that the GenRe ambassador program within the HIV/AIDS preventive strategy is vital and beneficial. The ambassadors serve as exemplars, significantly improving HIV/AIDS prevention practices among teenagers and cultivating a sense of empowerment. They develop essential life skills, garner trust as exemplary role models, and motivate constructive transformations among their peers. The advantageous outcomes of working as GenRe ambassadors encompass acting as role models; the ambassadors acknowledge these benefits as they fulfill their responsibilities, enhancing their ability to tackle obstacles and earning trust as dependable figures. Participants expressed the impact of the health education they received, highlighting personal growth and a more profound sense of responsibility in preventing HIV/AIDS. One participant shared how facing challenges helped one become more reflective and learn to manage emotions and mental resilience. Another participant felt empowered to set a positive example for others, citing enhanced knowledge, attitudes, and behaviors contributing to HIV/AIDS prevention.

Many participants recognized that the health education provided comprehensive information, known as ABCDE, for HIV/AIDS prevention. As one participant explained, the ABCDE framework represents key prevention strategies: "A" stands for "Abstinence," avoiding sexual intercourse before marriage; "B" for "Be faithful," maintaining fidelity with one partner; "C" for "Condom," emphasizing condom use during sexual intercourse; "D" for "Don't use drugs," specifically avoiding injectable drugs; and "E" for "Equipment," stressing the use of sterile equipment for invasive procedures. This framework empowered participants with practical guidelines to safeguard their health and prevent the spread of HIV/AIDS.

3.1.6. Instrument for Addressing Adolescent Difficulties

This study examined the influence of peer pressure on risk-taking behaviors and its function in moderating the link between a combined intervention and these behaviors. The findings demonstrated that as teenagers develop, their propensity for sexual risk-taking escalates. During this developmental phase, adolescents frequently pursue peer acceptability, rendering them more vulnerable to peer influences, which may increase risk-taking behavior. Parental oversight and supervision are essential in the lives of adolescents. Certain adolescents engage in risk-taking behaviors as a method of evading difficulties and depression. Peer education is a productive method for addressing teenage concerns and can be customized to ensure cultural sensitivity. Furthermore, intervention tools such as the friendship bench enable adolescents to address their concerns candidly with qualified community representatives. The friendship bench is a culturally attuned resource that acknowledges local relational dynamics, perhaps augmenting its efficacy in facilitating peer education [24].

3.1.7. Adolescents Perceptions of Peer Educators in HIV Prevention

This study involved peer educators of male and female adolescents from the same geographical area, selected by community leaders in the intervention regions. These adolescents underwent 20 weeks of training to provide various services, such as creating safe environments, conducting community advocacy, implementing structured assessment methods to tailor assistance and health promotion, and offering peer mentoring to facilitate access to health, social, and educational resources.

The respondents developed a strong connection with the trained peer educators and peers involved in delivering digital-based interventions through these educators. This connection made it easier to discuss sexual health topics they typically avoided with adults. However, some adolescents expressed concerns about sharing sensitive issues with peer navigators from their communities or receiving sexual health advice from individuals they perceived as non-

professionals. The direct delivery of information through link packages and sexual health materials by peer educators, whether or not it included HIV self-testing, was generally well-received by the respondents. Peer educators were viewed as professionally trained individuals, and many adolescents, especially young women, felt comfortable discussing sexual health information with them. One respondent remarked, "Discussing sexual health topics with peers is preferable because it creates a comfortable environment to talk about everything." Nonetheless, some male adolescents hesitated to share personal issues with community peer educators, fearing that such information might be misused [25].

Our research demonstrates that both peer-to-peer (PTP) methodologies in social networks and peer educators were greatly valued by youth, especially young women. The majority of participants had a sense of connection and solidarity with peer educators, enabling them to engage in discussions about sexual health topics they would usually avoid with adults. Nonetheless, several individuals articulated apprehensions over acquiring health information from acquaintances they saw as non-professionals.

A young woman illustrated this concern by comparing her friends and trained peer educators. She explained that when asking a friend for more information, the response might often be vague or incomplete, as they might claim not to remember. This, she noted, could lead to receiving inadequate information. In contrast, she emphasized that trained peer educators are equipped to provide detailed and reliable information, highlighting the difference in the support quality she experienced [26].

3.1.8. Key Factors Influencing the Effectiveness of HIV Prevention Knowledge in the Community

An educational program focused on HIV prevention for adolescents aged 13 to 19 is currently being implemented in the Moravian-Silesian Region of the Czech Republic. This program educates primary and secondary school students. It incorporates various activities, including peer programs, lectures with an HIV-positive speaker, AIDS counseling services, contact centers, and needle exchange, as components of a harm reduction strategy. On the day of the program, 1,264 students participated; however, 54 were excluded from the analysis due to incomplete or incorrectly completed questionnaires. The community program consists of a two-lesson educational lecture and an interactive game. Students are organized into four groups to accomplish eight tasks utilizing various educational tools, such as a magnetic board, magnetic cards, contraception samples, and condom training models. Participants receive points represented by unique "bouncing balls" for their contributions. A significant proportion of the 1,210 participants exhibited an enhancement in knowledge, thereby underscoring the program's efficacy. The most notable enhancement occurred in the youngest age group of 13 to 14 years, demonstrating an average knowledge increase of approximately 18%.

The Wilcoxon paired test, a non-parametric method, was employed to evaluate changes in total scores pre- and post-educational intervention. Mann-Whitney and Kruskal-Wallis tests were utilized to compare total scores across sex, age, and school type. A logistic regression model for dichotomous variables was used to determine the most significant factors affecting participant's knowledge. Low knowledge was characterized by a total score of less than 70%. The initial level of knowledge concerning the transmission of HIV from a positive mother to her child was recorded at 66.7% correct responses prior to education, which increased to 89.9% following educational intervention, reflecting a significant improvement exceeding 23%. An observable increase in knowledge was noted regarding non-transmission methods, including common kissing and insect bites. Before the educational program, a significant number of participants faced challenges with critical HIV-related topics, such as the existence of an HIV vaccine. Initially, only 56.5% answered correctly, but this figure increased markedly to 83.1% following the program.

Prior to the educational intervention, knowledge levels correlated positively with age; however, subsequent assessments revealed that the oldest students exhibited the lowest performance outcomes. The most significant effect of education was observed in the 13-14-year-old cohort, which enhanced their scores by approximately 18% (from 71.1% to 89.0%). The average improvement for the 17+ age group, which exhibited the highest initial knowledge, was 8.1%. This improvement, while modest, remained statistically significant. Before considering education, significant factors identified in the fully adjusted model included age and school type. Students in lower secondary schools demonstrated significantly lower scores than grammar school students (OR = 2.73; SE = 0.87; 95% CI: 1.46-5.09). Post-educational program analysis indicated that the differences in scores related to age and school type ceased to be statistically significant.

4. Discussion

The intervention utilized digital or mobile technology via websites or applications, unlike traditional care techniques (in-person or through non-digital media) for young individuals. The study's findings indicated a substantial enhancement in knowledge of HIV/AIDS and its prevention among participants in the intervention groups [27, 28].

Adolescents undergo a transitional phase that renders them susceptible to engaging in dangerous behaviors, including unsafe sexual practices. Insufficient comprehension of HIV/AIDS. Timely identification of HIV is essential to diminish transmission and enhance treatment.

Digital healthcare possesses significant potential in the 5.0 era. Consequently, digital health literacy, particularly in HIV transmission prevention among teenagers through autonomous education and screening, represents a significant opportunity [29]. Digital healthcare Integrating peer educator methodologies and digital media facilitates more participatory, personalized, and targeted health communications. Digital health serves as a strategic approach to address gaps in HIV prevention. It is essential to apply the principles of implementation science to enhance the design, evaluation, and eventual scaling of effective digital health initiatives [30].

The human immunodeficiency virus (HIV) is a pathogen that assaults the immune system of the body. Acquired immunodeficiency syndrome (AIDS) manifests at the terminal and most severe phase of the infection. AIDS is a dangerous viral illness that compromises the immune system. Its elevated fatality rate and exorbitant treatment costs present a substantial risk to public health and the economic stability of communities [31]. It is essential to prioritize the preventive and care requirements of teenagers regarding HIV as a sexually transmitted virus [32].

AIDS is presently regarded not merely as a sickness but as a social concern stemming from individual conduct, notably impacting individuals of diverse age groups, with teens being the most susceptible. Adolescence is a period characterized by experimentation and self-exploration, particularly with sexual identity. Typically, adolescents and young people do not see themselves as vulnerable to sexually transmitted diseases (STDs), including AIDS, and frequently conceal their sexual experimenting [31, 33].

Targeted community-based preventative initiatives expedite identifying undiagnosed persons and rectifying treatment access deficiencies. Empowered communities can more effectively mobilize and engage in collective action to address social and structural obstacles that affect health risks, vulnerabilities, and access to care. Community workers, comprising peers and non-professional providers, are integral to the HIV response by delivering outreach, prevention, testing, drug delivery, and comprehensive support for treatment adherence and healthcare navigation. Furthermore, the community level collects essential strategic information that may be overlooked by national HIV data systems and endeavors to promote and safeguard human rights [7, 32].

A peer possesses comparable attributes to another, including age, history, social status, and interests. Studies indicate that adolescents infrequently engage in discussions on sensitive health matters with specialists, typically depending on peers and friends for information. The function of peer educators in advancing health is intricately linked to peers' considerable impact during adolescence. Research suggests that adolescents are more inclined to seek assistance from informal sources, such as peers, than adults [34]. This indicates that adolescents seek health-related advice from their friends despite frequently encountering misinformation. This underscores the necessity for dependable sexual health education via avenues that are accessible and acceptable to youth. Peer health education can mitigate this gap by promoting candid dialogues around sexual health and guaranteeing the availability of accurate information. Peer education is a health promotion method that encourages community members to facilitate good health transformations among their peers. It entails disseminating health knowledge, values, and practices by instructing individuals with comparable social backgrounds or life experiences [7].

Digital peer educator interventions have rapidly developed to support HIV prevention, testing, and treatment, utilizing both organically user-developed platforms and those designed by practitioners. These interventions show promising potential, but more comprehensive evaluations are needed to assess their health impacts. While social media use can effectively reach marginalized individuals, commercial platforms present ethical, practical, and financial challenges. To address these issues, developing open-source, interoperable software with high privacy standards is essential [35].

The HIV prevention initiative emphasizing early detection is essential, particularly for adolescents, to aid the government in formulating HIV/AIDS plans aimed at achieving Zero New Infections, Zero AIDS-related Deaths, and Zero Stigma by 2030 [36]. Consequently, health education regarding HIV/AIDS designed explicitly for adolescents must be implemented. In the age of 5.0 technology, there exist chances to create digital health solutions that improve understanding of HIV/AIDS and its prevention strategies. From this perspective, our research findings can assess the efficacy of digital media interventions, such as websites or mobile applications, in enhancing knowledge and preventative strategies through peer education among adolescents.

This study has several limitations that should be acknowledged. First, this scoping review only includes articles published in English, potentially excluding relevant data from sources written in other languages. Second, the study

period is limited to publications from 2019 to 2024, which may overlook earlier studies that could provide significant insights into digital health interventions for HIV/AIDS prevention among adolescents. Third, although comprehensive, the use of five primary databases, such as Scopus and PubMed, may miss articles published in other relevant journals or platforms. Fourth, the approach did not involve a registered review protocol, which may introduce bias in the selection and synthesis of data. Additionally, this study only includes open-access articles, potentially limiting the diversity and representation of the literature. Finally, the findings are predominantly based on studies conducted in specific regions, such as Africa and Asia, which may not fully represent the global or other regional contexts.

5. Conclusion

Digital health interventions, such as community-based websites and mobile applications, particularly those utilizing peer educators, have demonstrated substantial enhancements in the knowledge and behaviors related to HIV/AIDS prevention among adolescents. This evaluation of publications advocates for using digital media, including social media, mobile applications, and websites, to facilitate a more participatory, personalized, and targeted dissemination of health messages. The function of peer educators in advancing health is intricately linked to peers' considerable impact during adolescence. Digital peer education programs are more effective than traditional techniques in enhancing adolescent understanding of HIV transmission and prevention. This study underscores the significance of digital media in facilitating the counseling service process by addressing accessibility and privacy, affecting adolescent's willingness to disclose their issues.

This study, based on seven papers, recommends that more research examine the effects of digital health interventions, mainly websites and mobile applications, in enhancing HIV testing rates among teenagers. Digital health initiatives can improve the efficiency of HIV services, aiding in the attainment of the Sustainable Development Goals (SDGs) and the 2030 'Triple Zero' target, particularly in detecting new HIV cases via testing.

A meta-analysis of multiple research indicates that this intervention may enhance adherence to HIV preventive activities in teenagers. Further assessment studies are advised to thoroughly comprehend digital media utilization in this context, particularly in low- and middle-income countries and among younger demographics.

Compliance with ethical standards

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Disclosure of conflict of interest

The author has no potential conflict of interest as affiliations with or involvement in any organization or entity with any financial such as honoraria, membership, employment, other equity interest, or non-financial interest such as a personal or professional relationship, knowledge, or beliefs in the subject materials discussed in this manuscript.

Author Contribution

NO and APP screened and selected the relevant synthesized information based on the eligibility criteria. NO and NS designed and supervised the study and structure of the manuscript. NO, NS, QESA, and RAS analyzed, synthesized, summarized, and supervised the study of the qualitative content. All authors read and approved the manuscript prior to submission for publication.

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	<p>Dr. dr. Hadi Susiarno, SpOG(K), M.Kes., MH.Kes is the head of the midwifery master's study program and has provided support during the preparation of this article. He is from the Département of Obstetric and Gynecology, Faculty of Medicine, University Padjadjaran, Bandung, Indonesia.</p>
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