



EFFECTS OF EDUCATIONAL TECHNOLOGIES ON KNOWLEDGE, ATTITUDE AND PRACTICE ABOUT THE PAP SMEAR: INTEGRATIVE REVIEW

EFEITOS DAS TECNOLOGIAS EDUCACIONAIS NO CONHECIMENTO, ATITUDE E PRÁTICA ACERCA DO PAPANICOLAOU: REVISÃO INTEGRATIVA

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ABSTRACT: Educational Technologies, when applied in educational actions, can enhance transformations in Knowledge, Attitudes, and Practices. Thus, the objective was to investigate the impact of the application of Educational Technologies used in health interventions for the prevention of Cervical Cancer on Knowledge, Attitudes, and Practices related to the Pap smear. This is an integrative literature review. The search was carried out in February 2025 in the Medline databases via PUBMED, LILACS, BDENF, IBECs, BIREME via BVS, Scielo, Scopus, Web of Science, and Science Direct. A total of 74 articles were identified, of which 9 comprised the final sample. The Educational Technologies found were: videos, oral educational sessions, monitoring via WhatsApp, multimedia kiosk, leaflets, mobile application, and television advertising. Oral educational sessions with monitoring via WhatsApp and informative videos were the only technologies that positively impacted all dimensions of the CAP triad, due to their suitability to the sociocultural, economic and linguistic context of the target population.

KEYWORDS: Educational Technology. Health Knowledge, Attitudes, Practice. Papanicolaou Test. Uterine Cervical Neoplasms.

RESUMO: As Tecnologias Educacionais quando aplicadas em ações educativas podem potencializar transformações nos Conhecimentos, Atitudes e Práticas. Dessa forma, objetivou-se investigar o impacto da aplicação de Tecnologias Educacionais empregadas em intervenções de saúde para prevenção do Câncer do Colo do Útero nos Conhecimentos, Atitudes e Práticas relacionadas ao exame Papanicolaou. Trata-se de revisão integrativa da literatura. Realizou-se a busca em fevereiro de 2025 nas bases de dados Medline via PUBMED, LILACS, BDENF, IBECs, BIREME via BVS, Scielo, Scopus, Web of Science e Science Direct. Foram identificados 74 artigos, dos quais 9 compuseram a amostra final. As Tecnologias Educacionais encontradas forma: vídeos, sessões educativas orais, monitoramento via WhatsApp, quiosque multimídia, folhetos, aplicativo móvel e propaganda televisiva. As sessões educativas orais com acompanhamento via WhatsApp e vídeos informativos foram as únicas tecnologias que impactaram positivamente todas as dimensões da tríade CAP, devido à sua adequação ao contexto sociocultural, econômico e linguístico da população-alvo.

PALAVRAS-CHAVE: Câncer de Colo Útero. Conhecimentos, Atitudes e Prática em Saúde. Teste de Papanicolaou. Tecnologia Educacional.

INTRODUCTION

Cervical Cancer (CC) is a malignant neoplasm of the uterine cervix, characterized by its slow and silent progression. The onset of this disease is associated with persistent infection with Human Papillomavirus (HPV) types 16 and 18¹. In 2020, this pathology was the second leading cause of cancer mortality in people with a uterus in 37 countries². Currently, in the global epidemiological landscape, cervical cancer ranks as the fifth most incident cancer and the fifth leading cause of cancer mortality among people with a uterus, excluding basal cell carcinoma².

Given its worldwide incidence, this cancer is considered a global public health problem. However, in developing countries with a low Human Development Index (HDI), cervical cancer represents a leading cause of mortality among people with a uterus^{2,3}. This scenario stems from the strong association between socio-economic vulnerability and the emergence of new cases and deaths from CC, as these individuals face greater barriers to accessing health services, which hinders the prevention, early diagnosis, and timely treatment of this pathology.

Despite the high incidence and mortality rates, this type of cancer is considered almost entirely preventable when prevention measures are well-implemented. Among these is the Papanicolaou test, an effective method for the prevention and early detection of cervical cancer, as it identifies precursor lesions⁴. This screening should be made available to people with a uterus who are sexually active and aged between 25 and 64 years⁵.

However, the influence of unfavorable Social Determinants of Health (SDOH) compounds the difficulties in accessing health services and proceeds to shape the Knowledge, Attitudes, and Practices (KAP) concerning the Papanicolaou test among people with a uterus⁶. Evidence indicates that a low level of health literacy about CC and its preventive methods is significantly associated with non-adherence to the screening⁷. This occurs because, without understanding the purpose of the test, it is not possible to grasp its importance. Furthermore, a low level of knowledge shapes negative attitudes—formulated by generational taboos, shame, and fear perpetuated across generations—which keeps the adherence rate to the Papanicolaou test low⁴.

Studies suggest that changing this scenario is possible through the development of actions aimed at health education on CC and the Papanicolaou test^{7,8}. Conducting these educational activities can positively impact the target population's adherence rates to the test, which may result in a reduced mortality rate due to early disease identification⁷.

The use of Educational Technologies (ETs) in educational initiatives has proven to be an effective approach that potentiates transformations in this context, as they facilitate knowledge transfer and promote change in a specific situation^{7,9}. Indeed, data reveal that the use of these technologies for education on CC prevention increased the levels of Knowledge, Attitude, and Practice regarding the Papanicolaou test¹⁰.

Given the above, this study is relevant due to the need to synthesize the ETs that have demonstrated positive effects on KAP related to the Papanicolaou test. The identification of these strategies is fundamental, as it can contribute to increasing adherence rates for preventive screening. The study is therefore justified by the significance of cervical cancer in the global epidemiological landscape, which makes it essential to identify effective interventions that promote adherence to screening, thereby favoring early diagnosis and reducing the disease's impact.

Thus, this study aims to investigate the impact of the application of Educational Technologies used in health interventions for cervical cancer prevention on the knowledge, attitudes, and practices related to the Papanicolaou test. The hypothesis of this study posits that the use of ETs that influence

Knowledge, Attitude, and Practice demonstrates greater efficacy in increasing adherence rates for the Papanicolaou test.

METHODS

This study is an integrative literature review. The methodological framework was based on the execution of seven stages: 1) Formulation of the research question; 2) Definition of inclusion and exclusion criteria; 3) Application of the search strategy; 4) Selection of articles through the evaluation of titles and abstracts; 5) Selection of articles based on full-text reading; 6) Quality assessment of the included studies; and 7) Synthesis of the selected sample¹³.

The research question was formulated using the PICO framework¹⁴, an acronym for Population (Women), Interest (Educational Technologies used in health interventions for Cervical Cancer prevention), and Context (modification of Knowledge, Attitudes, and Practices related to the Papanicolaou test). Thus, the guiding question was: "What are the implications of using Educational Technologies in health interventions for Cervical Cancer prevention on the Knowledge, Attitudes, and Practices related to the Papanicolaou test?"

Included in this study were full-text original articles, with no time or language restrictions. Duplicate articles and those that did not answer the research question were excluded.

The searches were conducted in February 2025 in the following databases: Medical Literature Analysis and Retrieval System Online (MEDLINE) via PubMed, Latin American and Caribbean Health Sciences Literature (LILACS), Nursing Database (BDENF), Spanish Bibliographic Index on Health Sciences (IBECS), Latin American and Caribbean Center on Health Sciences Information (BIREME) via the Virtual Health Library (VHL) Regional Portal, Scientific Electronic Library Online (SCIELO), Scopus, Web of Science, and the Science Direct academic search engine. Access to these sources was performed remotely through the Federated Academic Community (CAFe) via the journals portal of the Coordination for the Improvement of Higher Education Personnel (CAPES) of the Ministry of Education of Brazil (MEC).

The construction of the search strategy included the following controlled descriptors from the Health Sciences Descriptors (DeCS): "Câncer do Colo do Útero", "Tecnologia Educacional", "Conhecimentos, Atitudes e Prática em Saúde", and "Exame Papanicolaou"; and from the Medical Subject Headings (MeSH): "Uterine Cervical Neoplasms", "Educational Technology", "Health Knowledge, Attitudes, Practice", and "Papanicolaou Test". These descriptors were combined in different ways with the Boolean operator "AND" using the advanced search feature in the data sources. The combinations used in each database that yielded the highest number of articles are described in Table 1.

Table 1. Search strategies used in the research sources. Redenção, CE, Brazil, 2025.

Database	Search strategies
LILACS, BDENF, IBECS, BIREME	(Neoplasias do Colo do Útero) AND (Tecnologia Educacional) AND (Conhecimentos, Atitudes e Prática em Saúde) AND (Exame Papanicolaou)
Medline	(Uterine Cervical Neoplasms) AND (educational technology) AND (Health Knowledge, Attitudes, Practice) AND (Papanicolaou Test)
Web of Science	Educational Technology AND Papanicolaou Test
Science Direct, Scopus, and Scielo	Uterine Cervical Neoplasms AND Educational Technology AND Health Knowledge, Attitudes, Practice AND Papanicolaou Test

LILACS - Latin American and Caribbean Health Sciences Literature; BDENF - Nursing Database; IBECS - Spanish Bibliographic Index on Health Sciences; BIREME - Latin American and Caribbean Center on Health Sciences Information; MEDLINE - Medical Literature Analysis and Retrieval System Online; SCIELO - Scientific Electronic Library Online. Source: Prepared by the authors.

The articles resulting from the search strategy were extracted from the databases and exported to Rayyan¹³. The study selection occurred in two stages: 1) reading of titles and abstracts; and 2) full-text reading of articles for the final sample selection. This process followed the recommendations of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist¹² and was carried out by two independent reviewers, with a third researcher included to resolve any conflicts.

For data collection, organization, and analysis, a spreadsheet was created in Microsoft Excel to extract the information. The data were processed using Epi Info software, version 7.2.1.0, to obtain the relative and absolute frequencies of relevant variables. For data presentation, the bibliographic information of the studies—referring to authors, title, study design, level of evidence, language, year, journal, and database—was described with frequency values and presented in a table. The effects of the Educational Technologies on the Knowledge, Attitudes, and Practices related to the Papanicolaou test will be presented in a chart and a table.

The assessment of the level of evidence of the studies followed the categorization proposed by Melnyk and Fineout-Overholt, which classifies studies into six levels: I – meta-analysis of randomized controlled trials; II – experimental study; III – quasi-experimental study; IV – descriptive/non-experimental or qualitative study; V – case or experience report; VI – consensus and expert opinion¹⁵.

This study is exempt from submission to a Research Ethics Committee (REC) as it is an integrative review that uses only secondary data without identifying information, in accordance with the regulations of Resolution 466/2012 of the National Health Council (CNS)¹⁶.

RESULTS

The application of the search strategies in the research sources resulted in the identification of 74 articles. During the identification phase, six duplicates were found and excluded, resulting in 68 articles for title and abstract analysis. During the screening phase, 57 articles that did not meet the inclusion criteria were identified, and 11 articles were deemed eligible for full-text reading. In the final phase, inclusion, nine articles were identified that answered the research question, representing the final sample for the review (Figure 1).

All included articles were published in English (100%; n=9) in international journals, of which 66.66% (n=6) were indexed in Medline and 33.33% (n=3) in Scopus. The analysis of the studies' level of evidence revealed that clinical trials (Level II), quasi-experimental studies (Level III), and cross-sectional studies (Level IV) predominated equally, each representing 33.33% (n=3) of the sample.

The country with the predominance of studies was the United States of America, with 33.33% of the research (n=3). The other identified countries were South Africa, Malaysia, Ghana, Taiwan-China, India, and Australia, each with one article, equivalent to 11.11% of the sample (Table 2).

Regarding the educational technologies found, it was observed that all studies (100%; n=9) used structured educational materials and methods. Of these, 77.77% (n=7) used only one type of structured technology, while 22.23% combined it with a relational technology (e.g., discussion groups). The use of videos was prominent, implemented in 33.33% (n=3) of the articles. This was followed by the implementation of oral educational sessions, with 22.22% (n=2) representation; however, these were associated with other methods, such as pamphlets and follow-up via WhatsApp. Other technologies used were a multimedia kiosk (11.11%; n=1), a leaflet (11.11%; n=1), a mobile application (11.11%; n=1), and television advertising (11.11%; n=1) (Table 3).

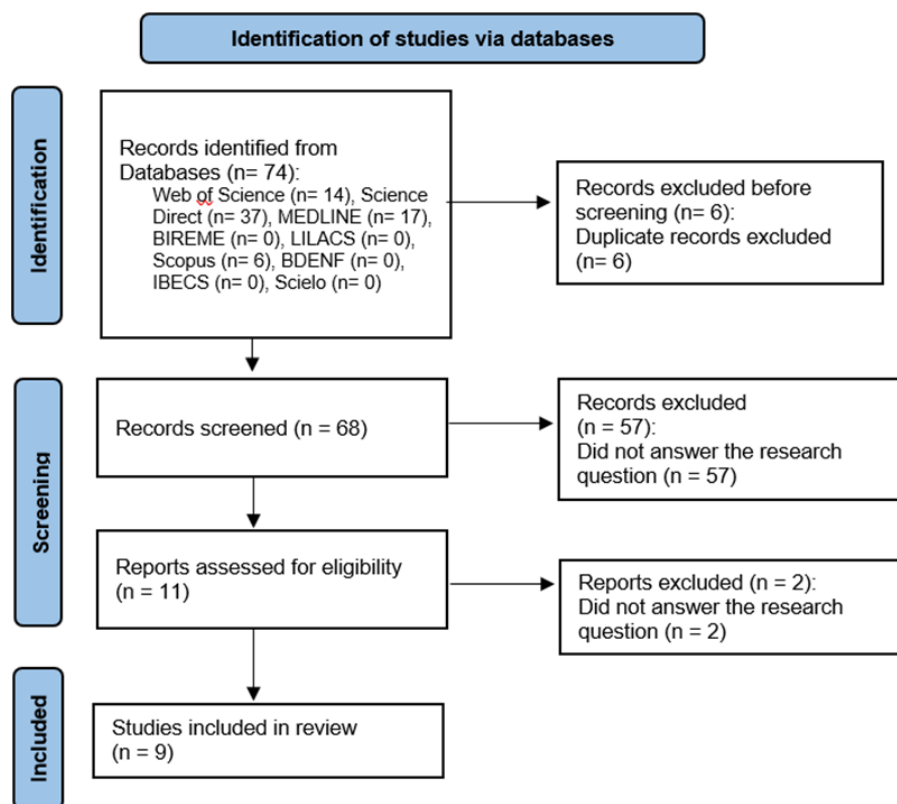


Figure 1. Flowchart of the study selection process included in the review, according to the Preferred Reporting Items for Systematic Review and Meta-Analyses (PRISMA). LILACS - Latin American and Caribbean Health Sciences Literature; BDENF - Nursing Database; IBECs - Spanish Bibliographic Index on Health Sciences; BIREME - Latin American and Caribbean Center on Health Sciences Information; MEDLINE - Medical Literature Analysis and Retrieval System Online; SCIELO - Scientific Electronic Library Online. Source: Adapted from the PRISMA 2020 statement model.

Table 2. Bibliographic data of the studies included in the sample. Redenção, CE, Brazil, 2025.

ID*	Authors / Year / Language	Title	Population / Country	Database/ Journal	Design/ Level of evidence
A1 ¹⁴	Ducray et al., 2021-English	Cervical cancer knowledge and screening uptake by marginalized population of women in inner-city Durban, South Africa: Insights into the need for increased health literacy	109 low-income women from South Africa	Medline / Women's Health	Mixed-methods cross-sectional study; LoE IV
A2 ¹⁵	Mohammad et al., 2022-English	The Effects of Theory-Based Educational Intervention and WhatsApp Follow-up on Papanicolaou Smear Uptake Among Postnatal Women in Malaysia: Randomized Controlled Trial	401 women from Malaysia	Scopus / JMIR Mhealth Uhealth	Randomized Controlled Trial; LoE II
A3 ¹⁶	Sheila et al., 2015- English	Comparing the Relative Efficacy of Narrative vs Nonnarrative Health Messages in Reducing Health Disparities Using a Randomized Trial	704 non-Hispanic white, Mexican American, and African American women from the United States	Medline / American Journal of Public Health	Randomized Controlled Trial; LoE II
A4 ¹⁷	Fret et al., 2016-English	Get Vaccinated! & Get Tested!: Developing Primary and Secondary Cervical Cancer Prevention Videos for a Haitian Kreyòl-speaking Audience	32 Haitian immigrant participants (30 women, 2 men) from urban and rural areas of the United States	Medline / J Health Commun	Quasi-experimental study; LoE III
A5 ¹⁸	Drokow et al., 2021-English	The Impact of Video-Based Educational Interventions on Cervical Cancer, Pap Smear and HPV Vaccines	645 women from Ghana	Scopus / Frontiers in Public Health	Cross-sectional study; LoE IV

ID*	Authors / Year / Language	Title	Population / Country	Database/ Journal	Design/ Level of evidence
A6 ¹⁹	Valdez et al., 2018- English	A Randomized Controlled Trial of a Cervical Cancer Education Intervention for Latinas delivered through Interactive, Multimedia Kiosks	943 low-income Latina women from the United States of America	Scopus / J Cancer Edu	Randomized Controlled Trial; LoE II
A7 ²⁰	Lee et al., 2016-English	The Effects of an Educational Intervention on Preventing Cervical Cancer Among Vietnamese Women in Southern Taiwan	260 Vietnamese immigrant women living in Taiwan	Medline / J Canc Educ	Quasi-experimental study; LoE III
A8 ²¹	Hombaiah et al., 2022- English	Effects of mobile Health (mHealth) application on cervical cancer prevention knowledge and screening among women social support groups with low-socioeconomic status in Mysuru city, Southern India	102 women of low socioeconomic status from India	Medline / PLoS ONE	Quasi-experimental study; LoE III
A9 ²²	Mullins et al., 2007-English	Encouraging the right women to attend for cervical cancer screening: results from a targeted television campaign in Victoria, Australia	1000 women between 25 and 65 years from Australia	Medline / Oxford University Press.	Mixed-methods cross-sectional study; LoE IV

Source: Prepared by the authors.

Table 3. Results of the application of Educational Technologies on women's Knowledge, Attitudes, and Practices related to the Papanicolaou test. Redenção, CE, Brazil, 2025.

ID*	Technology	Intervention design	Effects on knowledge, attitudes, and practices	Conclusion
A1	Oral Educational Session & pamphlets: Relational & structured technology	Intervention Design: Participants received an educational session on reproductive health, which used instructional models and pamphlets, with an emphasis on cervical anatomy, risk factors for cervical cancer, symptoms, prevention, screening, and treatment. After the session, the preventive exam was offered. It was delivered in English and isiZulu, according to the participants' needs.	In this study, before the educational action, only 30% of women had undergone cervical cancer screening. However, after the educational intervention, adherence to the Papanicolaou test increased significantly, with 64% (n=70) of participants taking advantage of the free exam. Despite the increase in testing, the results revealed that only 14 (20%) of the exams showed normal results. Post-intervention knowledge and attitudes were not assessed.	Community outreach initiatives that are gender-specific and conducted in accessible community centers, combining educational interventions in the participants' native language with the free provision of the Papanicolaou test, help increase screening adherence, especially among the most marginalized and vulnerable populations.
A2	Oral Educational Session with WhatsApp follow-up: Relational & structured technology Intervention	Design: The intervention was conducted in two phases. The first was an in-person session, led by a physician, including a 15-minute lecture on female reproductive anatomy, CC, early diagnosis, and the importance of the Pap test, followed by a 15-30 minute group discussion with 10-15 participants. The second phase consisted of a four-week WhatsApp follow-up with weekly 1-hour sessions where participants shared information and concerns. The control group received routine care. Effects were investigated via pre-test and four post-tests (immediately, 4, 8, and 12 weeks after the session).	The proportion of Papanicolaou tests was significantly higher in the intervention group compared to the control group at 12 weeks. After the intervention, participants in the intervention group showed significant improvements in knowledge scores ($F_{1,1171}=14.946$, $P<.001$), attitude scores ($F_{1,1171}=14.946$, $P<.001$), and adherence to the exam ($F_{1,1171}=10.432$, $P<.001$), demonstrating the intervention's positive impact.	The combination of an educational session and WhatsApp follow-up modified knowledge, attitudes, and practices regarding the Papanicolaou test more effectively than routine care.

ID*	Technology	Intervention design	Effects on knowledge, attitudes, and practices	Conclusion
A3	Video: Structured technology	Intervention design: Participants were randomly assigned to watch a narrative film or a non-narrative film, both containing the same information about cervical cancer prevention and detection. Effects were assessed at two weeks and six months.	Short-Term (2 weeks): Both films produced a significant increase in knowledge and positive attitudes. However, the effects were significantly greater for the narrative film group. Long-Term (6 months): Viewers of both films maintained knowledge and attitudes above baseline. Women who watched the narrative film continued to show more positive attitudes and were significantly more likely to have had or scheduled a Pap test.	The narrative film had a stronger and more lasting impact on increasing knowledge, improving attitudes, and promoting practices related to cervical cancer prevention, especially in undergoing the Papanicolaou test, compared to the non-narrative film.
A4	Video: Structured technology	Intervention Design: Two narrative videos, one focusing on primary prevention (HPV vaccine) and the other on secondary prevention (Pap test), were shown to three focus groups. Effects were assessed through guided discussions before and after the video exhibition.	The focus group discussions indicated that the videos increased knowledge of cervical cancer pathogenesis, improved attitudes towards the HPV vaccine, and positively influenced the intention to undergo screening and vaccination. The study did not assess participants' practices.	The created videos have the capacity to resonate with, inform, and educate their target audience, with the potential to influence future screening and vaccination behaviors, according to participants' stated intentions. However, investigation into their influence on women's behavior is necessary.
A5	Video: Structured technology	Intervention Design: A 15-minute educational video based on the Health Belief Model and Transtheoretical Model was played twice for participants. It contained information on the Pap test, HPV vaccine, CC incidence, risk factors, and symptoms. Effects were investigated via a pre-test and a post-test 6 months later.	Before the intervention, 84.2% of participants had some knowledge of cervical cancer; this rose to 100% after the intervention. Willingness to take the Pap test increased from 35.8% to 94.2%, and willingness to be vaccinated rose from 47.5% to 81.7%. Six months post-intervention, 42.2% of participants had undergone a Pap test, and 32% had started the HPV vaccination cycle.	The video contributed not only to increased knowledge, attitudes, and practices regarding the Papanicolaou test but also increased adherence to the HPV vaccine.
A6	Multimedia Kiosks: Structured technology	Intervention Design: The intervention used interactive touchscreen kiosks, adapted by language and age group, to address topics like CC, HPV, screening, and risk factors. Participants could navigate freely, pause, and print information. The control group received an informational leaflet.	Compared to the control group, the intervention group showed a higher level of knowledge and more positive attitudes during follow-up. However, there were no significant differences between the groups in the proportion of people who managed to schedule or undergo a Papanicolaou test during follow-up.	Interactive touchscreen kiosks are effective for educating vulnerable Latina women about cancer. The intervention improved knowledge and attitudes about cervical cancer screening. While there was no significant difference in screening behavior, the kiosks provided sufficient information to encourage some women to get tested.
A7	Educational Leaflet: Structured technology	Intervention Design: The intervention group received an educational leaflet with information on CC, the Pap test, and available clinics, plus a telephone helpline for questions. The control group received only the leaflet. Effects	Compared to the control group, the intervention group showed, at both time points, greater knowledge about cervical cancer and the Pap test, more positive attitudes toward screening, fewer barriers to testing, and a higher	Because leaflets are portable and can be saved and revisited, they are an effective educational tool. Therefore, they should be considered as an alternative in community educational

ID*	Technology	Intervention design	Effects on knowledge, attitudes, and practices	Conclusion
		were assessed via a pre-test and two post-tests at 3 and 6 months.	intention to get tested in the coming years. The study did not assess participants' practices.	actions.
A8	Mobile Application: Structured technology	Intervention Design: A mobile app with an interactive voice feature, educational topics on CC, self-screening guides, and reminders was provided to women from low-income social groups. Effects were assessed immediately, one month after, and two months after the intervention.	After the intervention, knowledge about signs and symptoms, risk factors, and the HPV vaccine increased 18-fold, 20-fold, and 30-fold, respectively. Regarding practice, adherence to the Papanicolaou test increased by 5% among participants. The study did not assess effects on attitudes.	The use of a mobile app with an interactive voice for women in unfavorable economic situations helped increase knowledge about CC but had little influence on the practical behavior of the participants.
A9	Television Advertising: Structured technology	Intervention Design: A television campaign was run on three broadcast channels during programs with high viewership among women aged 40-64, from July 2002 to August 2004. It contained information on overcoming emotional barriers and the need for timely screening for overdue women. Effects were evaluated in the final year of the campaign through telephone calls to women aged 25-65.	Between 2002 and 2004, adherence to the Papanicolaou test grew by 18% compared to 2001 data. The study did not assess effects on knowledge and attitudes.	For populations where knowledge about CC is already adequate, this technology proves effective for regulating the appropriate time for adherence to the Papanicolaou test.

Source: Prepared by the authors.

The implementation of an informational video and the oral educational session combined with WhatsApp follow-up were the only technologies that positively modified Knowledge, Attitudes, and Practices related to the Papanicolaou test (Table 4).

Table 4. Educational technologies and their effects on the KAP triad. Redenção, CE, Brazil, 2024.

EDUCATIONAL TECHNOLOGY	KNOWLEDGE	ATTITUDE	PRACTICE	STUDY
Oral Educational Session + Pamphlet	No ^a	No ^a	Yes	A1
Oral Educational Session + WhatsApp	Yes	Yes	Yes	A2
Narrative video	Yes	Yes	No ^a	A3
Narrative video	Yes	Yes	No ^a	A4
Informational video	Yes	Yes	Yes	A5
Multimedia kiosk	Yes	Yes	No ^a	A6
Leaflet	Yes	Yes	No ^a	A7
Mobile application	Yes	No ^a	Yes	A8
Television advertisement	No ^a	No ^a	Yes	A9

^aNot assessed in the study. Source: Prepared by the authors.

DISCUSSION

Educational Technologies emerge as crucial elements in guiding health practices and formulating public policies, as they play an important role in promoting both individual and collective self-care¹⁷. This study presents the results of using ETs as strategic allies in health interventions and highlights their

potential to transform the Knowledge, Attitudes, and Practices of people with a uterus regarding the Papanicolaou test. The positive modulation of this triad has been linked to better rates of CC prevention in both developed and developing countries¹⁴.

These technologies contribute to greater participant engagement in healthcare, assist in overcoming barriers within health services, and are effective in developing the KAP triad¹⁵. In this context, they enable the enhancement of performance and the strengthening of the patient's role, allowing them to assume an active position in their health-illness process while facilitating access to health information and eliminating obstacles along their journey¹⁵.

In this study, the results underscore the importance of using ETs in promoting CC care, especially in low-income countries where the challenges for preventing this type of cancer are significant¹⁸. It is noteworthy that although the United States is not classified as a low-income country, the technologies developed predominantly there, as shown by this study's findings, were aimed at overcoming challenges faced by vulnerable populations, such as immigrants, thereby highlighting profound existing inequalities¹⁸.

Indeed, recent evidence points to a reduction in cervical cancer morbidity and mortality rates in recent decades in developed countries like the United States and the United Kingdom¹⁹. However, it also highlights that factors such as social inequalities, available resources, and the level of knowledge about CC and its risk factors are strongly associated with low adherence to screening programs in these countries¹⁹. Consequently, better-informed people with a uterus are statistically more likely to participate in these programs, which underscores the need for targeted educational interventions to reduce disparities in access to and utilization of health services²⁰.

Consistent with the findings of this study, the approach centered on access to information proved superior to routine care, demonstrating a more pronounced positive impact on promoting preventive health. In fact, educational interventions are of utmost importance in empowering a target audience, making them active participants in the care process²¹.

However, it is essential to consider the cultural and social factors that influence these changes. A study conducted in Iran using mobile devices based on the I-CHANGE model demonstrated that virtual educational interventions grounded in behavioral change theory can improve preventive practices against cervical cancer and increase the intention to undergo the Papanicolaou test²².

The perceptible disparity between studies that implemented oral educational technologies prompts a reflection on the need for effective follow-up measures, especially dynamic methods that stimulate communication between professionals and the population²³.

It is important to recognize that the effectiveness of information transmission methodologies can vary concerning the modification of KAP. Therefore, when implementing an educational technology, it is essential that the author has a defined objective and a clear understanding of the target population's profile. The change in the KAP triad regarding adherence to the Papanicolaou test may be directly linked to the approach adopted by healthcare professionals during consultations. Thus, it is fundamental to be receptive to the patient, understand their motivations, and correct possible misconceptions about the purpose of the exam²⁴.

In addition to the educational approach adopted by healthcare professionals during consultations, structural and organizational factors also play a fundamental role in adherence to the Papanicolaou test. In this regard, one study that sought to evaluate the quality of care and monitoring actions for CC indicated that outreach and dissemination strategies for the target audience increase Papanicolaou test adherence rates²³.

The studies in this review highlighted the use of videos as educational tools, and their results showed that ETs in the form of educational videos are effective for modifying knowledge, attitude, and

practice. This emphasizes that videos are essential for improving CC screening²⁵. Such technologies aim to transfer information to a group about a specific topic. In the methodological and audiovisual model of narrative videos, where educational content is embedded within a story with characters, the results are more positive when compared to informational videos²².

Given the possibility of the audience identifying with the character presented in a narrative video and associating the narrated story with the crucial information being conveyed, narrative videos show greater effectiveness in improving the knowledge, attitude, and practice of people with a uterus concerning CC²².

The findings of this study may contribute to the development and implementation of educational technologies regarding cervical cancer, assisting researchers in elucidating preventive methods for this pathology. However, this research had as a limitation the scarcity of studies using 'hard' technology (i.e., physical equipment or devices), either in isolation or in combination with other methods. Furthermore, there was a predominance of studies that did not aim to evaluate all domains of KAP: 11.11% of the technologies proposed to evaluate knowledge in isolation, 44.44% of the studies sought to analyze knowledge and attitude, 22.22% observed only practice, 11.11% measured changes in knowledge and practice, and only 22.22% evaluated all three domains.

Given the above, the results of this study reinforce the relevance of ETs as effective strategies for health promotion and for expanding access to information about the Papanicolaou test. Moreover, the application of these technologies in training for professionals and in health education programs can contribute to improving the quality of the educational approach during consultations and enhance adherence to CC screening, especially among vulnerable populations with barriers to accessing health services. Therefore, it is recommended that public health policies consider the use of these tools as an integral part of CC prevention strategies to foster a more inclusive and accessible approach.

CONCLUSION

This study demonstrated the impact of ETs in promoting and enhancing Knowledge, Attitudes, and Practices related to the Papanicolaou test. Although all technologies showed positive results in at least one aspect of the KAP triad, it is noteworthy that the oral educational session combined with WhatsApp follow-up and the use of informational videos based on behavioral theories were the only interventions that successfully modified all three dimensions positively.

Thus, the positive impact of these technologies on the KAP triad was directly associated with their suitability to the economic, sociocultural, and linguistic context of the target population. This adaptation enabled significant changes, promoting patient autonomy in gynecological health care and resulting in greater adherence to the Papanicolaou test. Therefore, this highlights the need for research that evaluates the continuous use of educational technologies in promoting preventive behaviors among people with a uterus, especially concerning continued adherence to the Papanicolaou test.

In this sense, future research should deepen the understanding of the long-term effectiveness of educational technologies, considering different socioeconomic and cultural realities. Additionally, their systematic incorporation into health education strategies can strengthen adherence to preventive practices. In doing so, they can contribute to reducing inequalities in access to the Papanicolaou test and, consequently, to the early detection and prevention of cervical cancer.

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