

# The Role Of Digital Health Technology In Cervical Cancer Screening: Review Literature

Nanik Setiyawati\* , Lucky Herawati , Heni Puji Wahyuningsih , Yuni Kusmiyati , Hesty Widyasih , Dwiana Estiwidani , Yuliasti Eka Purnamaningrum

Poltekkes Kemenkes Yogyakarta.

---

## ABSTRACT

The World Health Organization (WHO) calls cervical cancer the fourth type of cancer with high fatal rate for women. Prevention of cervical cancer can be done by doing an early cervical health examination (screening) because the symptoms of cervical cancer are not seen until a more severe stage. IVA is a cervical cancer screening method recommended by WHO. Midwives make observations of discoloration of the cervix using eyes with the help of lighting lamps. Digital technology on midwifery services is still limited. Until now, the cervical cancer screening with IVA have no digital technology to overcome the subjectivity of the examiner. The IVA test still depends on observers' eyes only without any other aids. The purpose of this study was to attain the theoretical study on the use of digital medical devices for cervical cancer screening. This study uses literature review. The data source in this study came from scientific journals taken from Pubmed. The keyword used was digital tool in health. There were 5 journals which meet the criteria of of inclusion and exclusion from 84 articles published in 2017 up to 2022. Medical devices were needed to improve accuracy in cervical cancer screening examination. It was necessary to review the use of health technology in cervical cancer screening to get more accurate test results; resistance tests from digital tools in cervical cancer screening examinations; and assessment of digital technology acceptance for cervical cancer screening among the midwives.

## BACKGROUND

Cervical cancer is a malignancy in the cervix. The World Health Organization (WHO) calls cervical cancer the fourth type of cancer with high fatality rate for women. This cancer is most commonly found in developing countries compared to developed countries (1). Recent data of cervical cancer cases in Indonesia showed that 32,469 people and 266,000 women died every year due to cervical cancer. Cervical cancer is a threat to health that should be managed at least until 2030, involving the treatment for people living with cervical cancer (2). The incidence of cancer in Indonesia is 136.2 per 100,000 population. It is the 8<sup>th</sup> among Southeast Asia countries, and

become 23<sup>rd</sup> in Asia. The incidence of cervical cancer is 23.4 per 100,000 population with an average death rate of 13.9 per 100,000 population (3). Indonesia has increased from 1.4 per 1000 inhabitants in 2013 to 1.79 per 1000 population in 2018. The highest prevalence of cancer is in the Special Region of Yogyakarta which is 4.86 per 1000 population, followed by West Sumatra 2.47 per 1000 population and Gorontalo 2.44 per 1000 population (4).

Cervical cancer can be prevented through interventions such as cancer screening. WHO has launched a global program to eliminate cervical cancer with the following targets: all countries must achieve 90% for vaccination coverage, 70% for screening coverage, and 90% for treatment access coverage of pre-cervical cancer or cervical cancer (5). Prevention of cervical cancer can be done through an early cervical health test (screening) because the symptoms of cervical cancer are not seen until a more severe stage. The Acetic Acid Visual Inspection Method (IVA) is a method of early detection of cervical cancer applied by 26 countries. IVA is a cervical cancer screening method recommended by WHO. Visual Acetic Acid inspection is noninvasive and possibly applied in low-tech health facilities with rapid results (6). Early detection of cervical cancer with IVA is a visual examination of the cervix using 3-5% acetic acid. The use of acetic acid on IVA examination will change the color of abnormal cervical cells into white which indicates the possibility of precancerous lesions. The color change can be observed immediately by the midwife and the result can be obtained soon after observation. Midwives make observations of discoloration of the cervix using eyes and helped by lighting lamps (7). Observation with the eyes only will be subjective and the result can be different depending on the sharpness of the midwife's vision. The subjectivity observation can affect the accuracy of the test result. In addition, observation using direct eyes is lacking the image quality control. Observation techniques using direct eyes can differ among the observers because they are influenced by midwives' eyes sharpness, working experience, and training background (8).

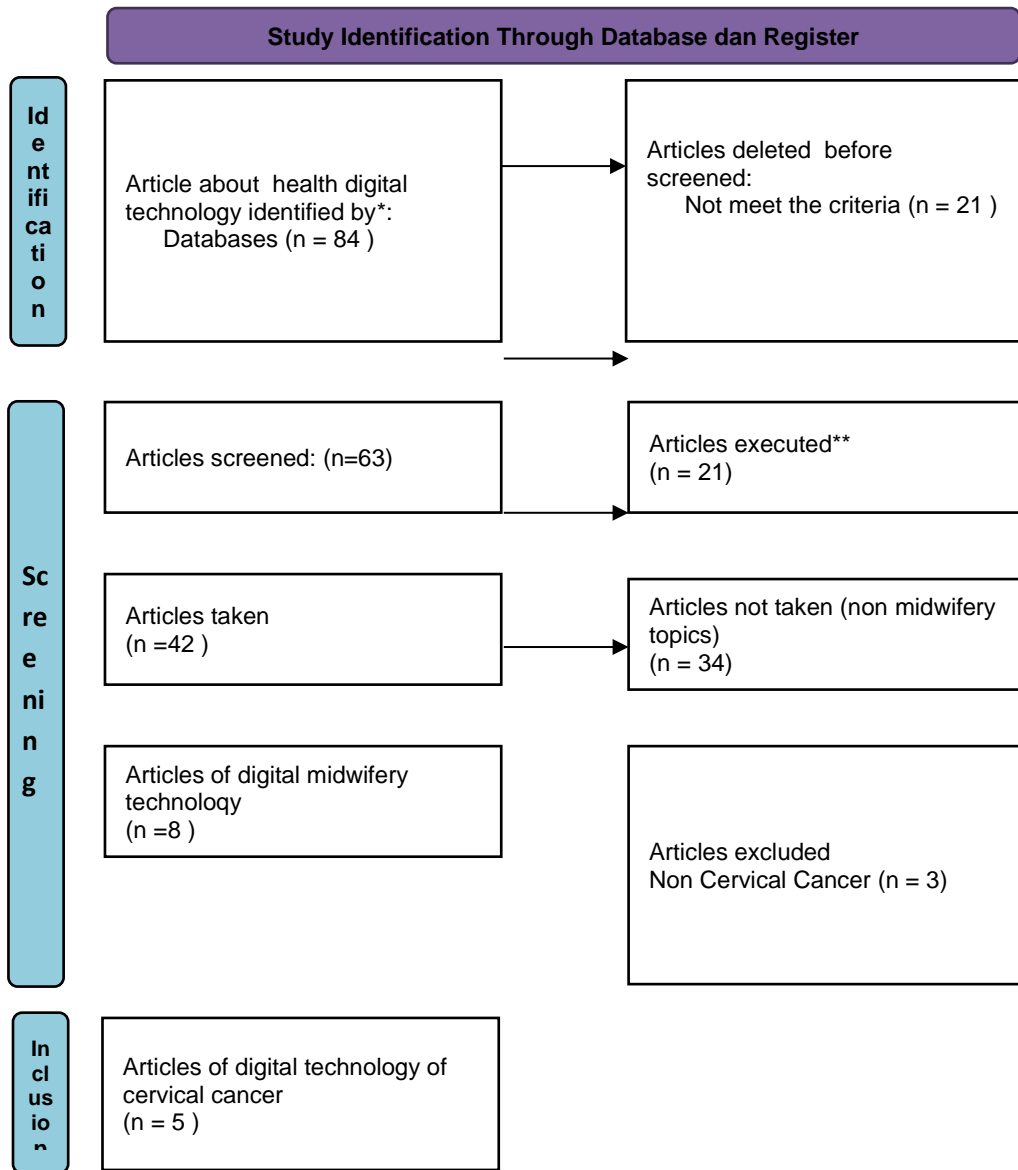
The era of digital transformation has changed lives a lot. The availability of real-time information is helpful in taking effective, accurate, quick decision, specifically in healthcare. Headway in technology have helped healthcare providers with the availability of appropriate and innovative tools. The role of digital technology in healthcare can be seen in various ways including helping to synchronize patient data so that doctors can use information in real time so that they are able to provide appropriate recommendations for patients. Digital technology brings many benefits to health services and with the right approach, it is not difficult to adopt technology to meet the needs of consumers (9) The Ministry of Health of the Republic of Indonesia strongly supports and encourages the use of digital technology for health in the future (10). The Indonesian Ministry of Health together with the United Nations Development Programme (UNDP) launched a blueprint of health digital transformation strategy of 2024. The transformation of the health technology system strategy launched is to ensure that the focus of health digital technology changes from the reporting to serving. Information technology platform that can be used by other stakeholders, people, hospitals, pharmacies, laboratories, pharmaceutical companies and startups in the health industry (11). The use of health digital technology was increasing during the Covid Pandemic, including laboratory tests, ECG smartwatches, telemedicine, mental health services and digital

health investments. Digital technology is utilized by health facilities to improve the effectiveness, efficiency and improvement of service quality (12).

Digital technology can be a solution for health service problems, including midwifery services. Digital technology on midwifery services is still limited. In the case of cervical cancer screening with IVA, there is no digital technology to overcome the subjectivity of the examiner. IVA test still uses bare eyes without aids to observe (8). Based on these conditions, digital technology is appropriate to apply in midwifery since the process and the result is more visual, simple, accurate, and accepted by the community. It gives more benefits than other digital health technology from any aspects and potentially to be commercialized. The purpose of this study is to do the theoretical study on the use of digitalization of medical devices for cervical cancer screening.

## **METHOD**

This study used literature review. It was descriptive study through scientific searches as the design. The data source was taken from 84 articles of scientific journals of Pubmed published in 2017 up to 2022. The keyword used was digital tool in health. Data sources was selected based on several aspects: (1) Provenance (evidence) i.e. aspects of author credentials and evidence support; (2) Objectivity is whether the perspective of the author is beneficial or not; (3) Persuasiveness (degree of trust) is whether the author belongs to the group of people who can be trusted; (4) Value (contributive value) is whether the author's argument is convincing and has contributed to other significant research. Data collection methods use documentation methods.



**Figure 3.** Data Collection Methods

## RESULT

### 1. Study of Digital Technology Literature in Midwifery Literacy about digital technology in midwifery

**Table 1.** Study of Digital Technology Literature in Midwifery

No	Types of tools	Research	Result
1.	Smartphones	Smartphone-Based Visual Inspection with Acetic Acid: an Innovative tool to improve Cervical Cancer Screening in Low-Resource Setting (8)	Literature review Smartphones was a good tool in early detection of cervical cancer to see lesions in the cervix.
2.	Digital cervical photography and colposcopy	Cervical Digital Photography: An Alternative Method to Colposcopy. Elise de Castro Hillmann, Omar Moreira Bacha, Micehal Roy, Djamal Berbiche, Victor Nizard, Jose Geraldo Lopes Ramos Journal of Obstetrics and Gynecology Canada. 2019 Vol 41 issue 8 (13)	Digital cervix had higher sensitivity and predictive value compared to colposcopy. The accuracy of both tools were similar. Cervical digital photography was an alternative to colposcopy
3	Camera	Comparison of Papsmear, visual inspection with acetic acid, human papillomavirus BNA-PCR testing and cervicography H De Vuyst, P Claeys S Njiru, L Muchiri, S Steyaert, P De Sutter, E Van Marck, J Bwayo, M.Temmerman International Journal Gynaecology Obstetri 2005 May, 89 (2): 120-6 (14)	Visual methods of IVA and cervicography were similar and accurate
4	Digital cervikography	The Burden of Cervical pre-cancer and cancer in HIV positive women in Zambia: modeling study (15) Allen C Bateman etc	Digital cervikography, cytology and histology results might identify cervical disease

- 5 eC<sub>3</sub> (electronic cervical cancer control) BMC Cancer (2015) 3:541 pm  
eC<sub>3</sub> – a Modern Telecommunications Matrix for Cervical Cancer Prevention in Zambia  
Parham GP etc. PMC. 2013 (16)  
eC3 was an appropriate technology to bridge the gap between screening and diagnosis. Molecular human papillomavirus-based screening and wireless telemedicine communication

**Midwifery technology articles**

- 6 Assisted Reproductive Technology (ART) Assisted Reproductive Technology: on overview of Cochrane Reviews  
Cindy Farquhar, Jane Marjoribanks.  
Cochrane Library Databased Reviews. 2018 (17)  
ART for fertility treatment required expensive and risky costs.
- 7 Gynekologic Survivor Tool (GST) Gynekologic Survivor Tool: Development, Implementation and Symptom Outcomes  
Carter J etc. JCO an American Society of Clinical Oncology Journal. 2022 February;6:e2100154 (18)  
As electronic reporting of the patients, GST was eligible and time saving
- 7 Data check request form Inadequate clinical data on Pap Test Request Form: Where are we headed in the era of precision medicine?  
Neeta Kumar, Ruchika Gupta, Sanjay Gupta  
Cyto Journal. 2020;17:1 (19)  
Inadequate clinical data on Pap test request forms due to a wide variety of factors

**IVA articles with no technology**

- 8 Ordinary Eyes Cervical Cancer Screening- The Challenges of complete pathways of care in low-income countries: Focus on Malawi  
Heather A Cuby, Christine Campbell  
IVA results showed high subjectivity, low performance, and limited quality control

Digital technology is an appropriate electronic device. Digital technology used in cervical cancer test includes smartphones, cameras, colposcopy, digital cervical photography, cervical photography, cervical photography and electronic cervical cancer control. This digital technology is used in the detection and treatment of cervical cancer so that the results are more accurate, sensitive and can be handled properly immediately.

## **DISCUSSION**

Technological achievements in the field of health provided benefits such as improving the accuracy, effectiveness, and efficiency of test results, time saving of treatment, the availability of adequate tool, and having economic value as a commodity (21). Digital technology on midwifery services was still limited. In the case of cervical cancer screening with IVA, there was no digital technology to overcome the subjectivity of the observer. IVA observation still used direct eyes and had been supported by no tool so that the results obtained were less accurate and subjective (8). Digital technology could be a solution to the problem of cervical cancer screening. Digital technologies on cervical cancer screening that had been used based on the above literacy were smartphone cameras, digital cervicography and colposcopy. Mobile phone/smartphone cameras were potentially improve the efficiency of cervical cancer screening using visual inspection methods with acetic acid (IVA). (22), but the use of smartphones camera to catch the genital organs was not proper in the eastern culture of Indonesia because those probably annoyed the patients' comfort and privacy. Some of the reasons why women reluctantly having IVA test were because of the shame feeling. Hence, applying IVA should concerns to the aspect of the comfort and privacy of the patients (23). The use of smartphones on the other side, also gave negative risk, particularly on the misuse of data by irresponsible persons or organisation (21).

The weakness of digital sevikography was in the aspect of taking pictures and maintaining images without distortion (a.g. color fluctuations, insufficient light intensity, unstable resolution) (14) (15). As a result, the image was less satisfying for the accuracy of the test data. Not all midwives were able to provide tools and are able to use colposcopy. Therefore, the IVA service usually carried out in primary service facilities having no colposcopy would be constrained. It was important to consider digital technology tools for cervical cancer screening from various aspects. Empirical and acceptance study of this technology should be applied before launching the tools commercially.

## **CONCLUSION**

Based on a theoretical review of the utilization of medical devices for cervical cancer screening, it was concluded that the specific medical tools are needed to improve the accuracy in cervical cancer screening test. Considering that there had been some technology used, it was necessary to conduct

endurance testing to find advantages among existing tools reviewed. In addition, it was also necessary to conduct empirical and acceptance testing from existing digital tools to accurately assess cervical cancer screening.

### **THANK YOU**

Having best support during the process of doing the research, we express our gratitude to the Director Yogyakarta and colleagues of Poltekkes Kemenkes Yogyakarta

### **CONFLICT OF INTEREST**

There is no conflict of interest in this study.

### **BIBLIOGRAPHY**