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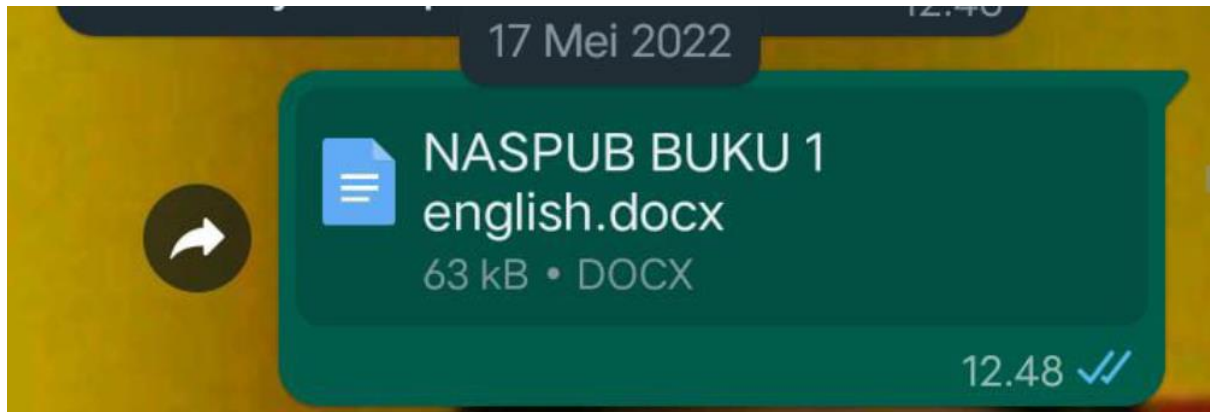
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1. BUKTI SUBMISSION (17 MEI 2022)



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

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ABSTRACT

The World Health Organization (WHO) called cervical cancer the fourth most common type of cancer that attacks women and was deadly. Prevention of cervical cancer can be done by conducting an early cervical health examination (screening) because the symptoms of cervical cancer are not visible until the stage is more severe. Visual Inspection Acetic Acid (VIA) was a cervical cancer screening method recommended by WHO. In VIA midwife observes the discoloration of the cervix using ordinary eyes with the help of a lamp. The VIA examination was still using ordinary eyes without any digital technology to observe. The aim of this study was to obtain a theoretical study on the use of digitizing medical devices for cervical cancer screening. This study uses a literature review. The data sources in this study used scientific journals taken from Pubmed. The keyword used was digital tool in health. Obtained 84 articles for the years 2017 to 2022. The conclusions of this study are as follows used on a theoretical study on the use of digitizing medical devices for cervical cancer screening, medical devices are needed to increase accuracy in cervical cancer screening examinations. It was necessary to study the use of health technology in cervical cancer screening to obtain more accurate examination results, needed to test the resilience of digital tools in cervical cancer screening examinations, needed to assess the acceptance of digital technology for cervical cancer screening in midwives as implementing officers.

Keywords: digital technology, cervical cancer, VIA

BACKGROUND

Cervical cancer is a malignancy originating from the cervix. The World Health Organization (WHO) calls cervical cancer the fourth most common type of cancer that attacks women and is deadly. This cancer is most commonly found in developing countries compared to developed countries (Ministry of Health, 2019). New cases of cervical cancer in Indonesia reached 32,469 people and 266,000 women die each year from cervical cancer. Cervical cancer is a threat to health that must be suppressed at least until 2030 consisting of current actions against people living with cervical cancer (Ministry of Health, 2017b). The incidence of cancer in Indonesia, which is 136.2 per 100,000 population, ranks 8th in Southeast Asia, while in Asia it ranks 23rd. The incidence of cervical cancer is 23.4 per 100,000 population with an average death rate of 13.9 per 100,000 population (Indonesian Health Profile 2019, 2020). Based on Riskesdas data in 2018, the prevalence of tumor/cancer in Indonesia showed an increase from 1.4 per 1000 population in 2013 to 1.79 per 1000 population in 2018. The highest cancer prevalence was in the Special Region of Yogyakarta, namely 4.86 per 1000 population, followed by West Sumatra 2.47 per 1000 population and Gorontalo 2.44 per 1000 population (Riskesdas, 2018).

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% coverage for vaccination, 70% coverage for screening and 90% for coverage of access to treatment for pre-cervical cancer or cervical cancer. (World Health Organization, 2020). Prevention of cervical cancer can be done by conducting an early cervical health examination (screening) because the symptoms of cervical cancer are not visible until the stage is more severe. Visual Inspection Acetic Acid (VIA) method is an early detection method for cervical cancer that has been carried out in 26 countries. IVA is a cervical cancer screening method recommended by WHO. IVA is non-invasive and can be performed in a low-tech health facility with fast results (World Health Organization, 2021). Early detection of cervical cancer with VIA is a visual examination of the cervix using 3-5% acetic acid. The use of acetic acid in the VIA examination will turn abnormal cervical cells into white and this indicates the possibility of precancerous lesions. This color change can be observed immediately by the midwife and the results of the examination can be known immediately. The midwife observes the discoloration of the cervix using ordinary eyes with the help of a lamp (Ministry of Health, 2017a).

Observations with the eyes alone will be subjective and can differ between people depending on the sharpness of the midwife's eyes. The subjectivity of the results can affect the accuracy of the examination results. In addition, observations using the eye are lacking in image quality control. Observation techniques with ordinary eyes may differ between officers because it is influenced by eye acuity, experience of midwives, training that has been followed (Sami et al., 2022).

The era of digital transformation has changed many lives. The availability of real time information helps make effective and accurate decisions in a short time, including in health services. Advances in technology have helped health care providers with the availability of appropriate and innovative tools. The role of digital technology in health services can be seen in various ways including helping to synchronize patient data so that doctors can use information in real time 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 consumer needs (Yuda, 2018). The Indonesian Ministry of Health strongly supports and encourages the use of digital technology for health in the future (Ministry of Health, 2021b). The Indonesian Ministry of Health together with the United Nations Development Program (UNDP) launched a blueprint for the health digital transformation strategy in 2024. The transformation of the health technology system strategy that was launched was to ensure that the focus of digital health technology changed from reporting to service. An information technology platform that can be used by other stakeholders, the people, hospitals, pharmacies, laboratories, pharmaceutical companies as well as startups in the health industry (Ministry of Health, 2021a). The use of digital health technology during the Covid pandemic includes laboratory tests, watches equipped with ECG, telemedicine, mental health services and digital health investment. Digital technology is used by health facilities to increase effectiveness, efficiency and improve service quality (Kemenkominfo, 2019).

Digital technology can be a solution to problems in health services, including midwifery services. Digital technology in midwifery services is still limited. In the case of cervical cancer screening with VIA, there is no digital technology to overcome the examiner's subjectivity. The VIA examination is

still using ordinary eyes without any tools to observe (Sami et al., 2022). Based on these conditions, it is necessary to use digital technology in midwifery that can be seen, is simple, accurate, accepted by the community, has advantages over other digital health fields from all sides and has the opportunity to be commercialized. The aim of this study is to obtain a theoretical study on the use of digitizing medical devices for cervical cancer screening.

METHODS

This study uses a literature review. This study is descriptive in nature with a scientific search design. Literature review can be interpreted as a description of theories, findings and other research materials obtained from reference materials to be used as a basis for research activities to develop a clear framework of thinking from the formulation of the problem to be studied. The data sources in this study used scientific journals taken from Pubmed. The keyword used is digital tool in health. Obtained 84 articles for the years 2017 to 2022. The selection of data sources is based on the following aspects: (1) Provenance (evidence), namely aspects of author credentials and evidence support; (2) Objectivity, namely whether the author's perspective idea has many uses; (3) Persuasiveness (degree of belief) ie whether the author belongs to the group of people who can be trusted; (4) Value (contributive value), namely whether the author's argument is convincing and has a significant contribution to other research. The data collection method used the documentation method.

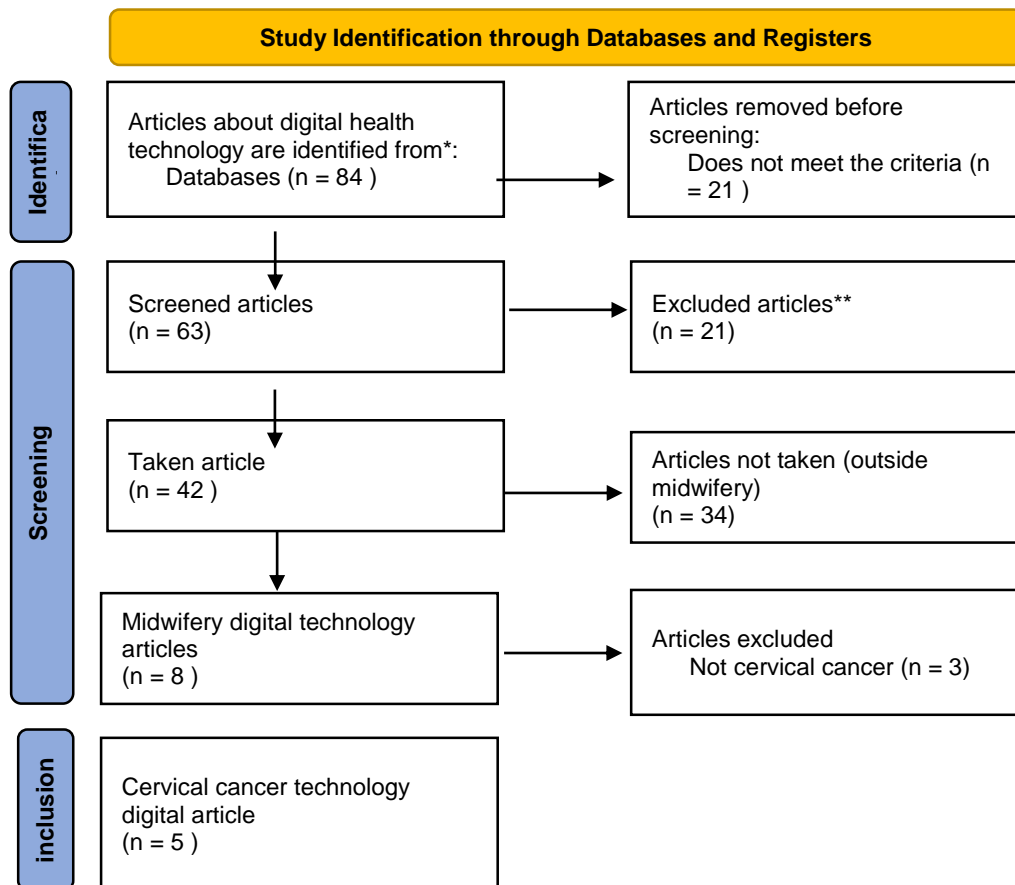


Figure 3. Data Collection Method

RESULTS

1. Literature Review of Digital Technology in Midwifery Literacy on digital technology in midwifery

Table 1. Literature Review of Digital Technology in Midwifery

No	Tool type	Study	Results
1.	Smartphone	Smartphone-Based Visual Inspection with Acetic Acid: an Innovative tool to improve Cervical Cancer Screening in Low-Resource Setting(Sami et al., 2022)	Literature review Smartphone is a good tool in early detection of cervical cancer to see lesions on 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(Hillmann, Elise; Bacha, Omar Moreira; Roy, Micehal; Berbiche, Djamal; Nizard, Victor; Ramos, 2019)	Cervical digital is higher in sensitivity and predictive value than colposcopy. The accuracy of the two is very similar Digital photography of the cervix is 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 of Obstetrics Gynecology 2005 May, 89 (2): 120-6(H De Vuyst, P Claeys S Njiru, L Muchiri, S Steyaert, P De Sutter, E Van Marck, J Bwayo, 2015)	Visual IVA and cervicography methods are similar and show accuracy
4	Digital cervicography	The Burden of Cervical pre-cancer and cancer in HIV positive women in Zambia: modeling study(Bateman et al., 2015) Allen C Bateman etc BMC Cancer (2015) 15:541	Digital results of cervicography, cytology and histology can reveal cervical disease
5	Assisted Reproductive Technology (ART)	Assisted Reproductive Technology: on overview of Cochrane Reviews Cindy Farquhar, Jane Marjoribanks.	ART for fertility treatment is expensive and risky.

		Cochrane Library Databased Reviews. 2018(Farquhar and Marjoribanks, 2018)	
6	Gynecological Survivor Tool (GST)	Gynecologic Survivor Tool: Development, Implementation and Symptom Outcomes Carter J etc. JCO an American Society of Clinical Oncology Journal. 2022 February;6:e210154(Carter, Jeanne; Abu Rustum, Nadeem; Saban, 2022)	GST meets eligibility with minimal time as electronic reporting for patients
7	eC3 (electronic cervical cancer control)	eC3 – a Modern Telecommunications Matrix for Cervical Cancer Prevention in Zambia Parham GP etc. PMC. 2013(Parham; Groesbeck; Mulindi, 2013)	eC3 is an appropriate technology to bridge the gap between screening and diagnosis. Molecular human papillomavirus based screening and wireless telemedicine communication
8	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(Kumar, Neeta; Gupta, 2020)	Insufficient clinical data on the Pap test request form due to various factors
9	Ordinary Eyes	Cervical Cancer Screening- The Challenges of complete pathways of care in low-income countries: Focus on Malawi Heather A Cuby, Christine Campbell Women's Health 2020(Heather, A Cubie; Campbell, 2020)	The VIA results show high subjectivity, low performance and limited quality control

DISCUSSION

Digital technology on cervical cancer that has been used based on the above literacy is a smartphone camera, digital cervicography and colposcopy. Mobile phone/smartphone cameras have the potential to increase the efficiency of cervical cancer screening using the visual inspection method with acetic acid (IVA)(Chandra, Tania; Fahmi, M Nailul; Mahendradhata, 2018), but the use of smartphones to photograph the genitalia of patients with eastern culture in Indonesia will disturb the comfort and privacy of patients. As a result, patients feel embarrassed and afraid if their genitalia are photographed using a smartphone. The negative impact of technology is the use of data by irresponsible parties(Pen, 2016).

Use of digital cervicography has the disadvantage of taking pictures and maintaining images without distortion (Color fluctuations, insufficient light intensity, unstable resolution)(H De Vuyst, P Claeys S Njiru, L Muchiri, S Steyaert, P De Sutter, E Van Marck, J Bwayo, 2015) (Bateman et al., 2015). As a result, the resulting image is less than optimal for the accuracy of the inspection data. The use of colposcopy not all midwives are able to provide tools and are able to use them, as a result VIA services

that can be performed in primary care facilities do not have colposcopy. It is necessary to test the resilience of digital technology tools in cervical cancer screening.

CONCLUSIONS

The conclusions of this study are as follows based on a theoretical study on the use of digitizing medical devices for cervical cancer screening, medical devices are needed to increase accuracy in cervical cancer screening examinations. It is necessary to study the use of health technology in cervical cancer screening to obtain more accurate examination results. A study is needed to test the resilience of digital tools in cervical cancer screening examinations. A study is needed to assess the acceptance of digital technology for cervical cancer screening in midwives as implementing officers.

ACKNOWLEDGEMENTS

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CONFLICT OF INTEREST

“No Potential conflict of interest was reported by the authors”

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2. HASIL REVISI



**The Role of Digital Health Technology
in Cervical Cancer Screening: Review Literature**

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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 8th among Southeast Asia countries, and become 23rd 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.

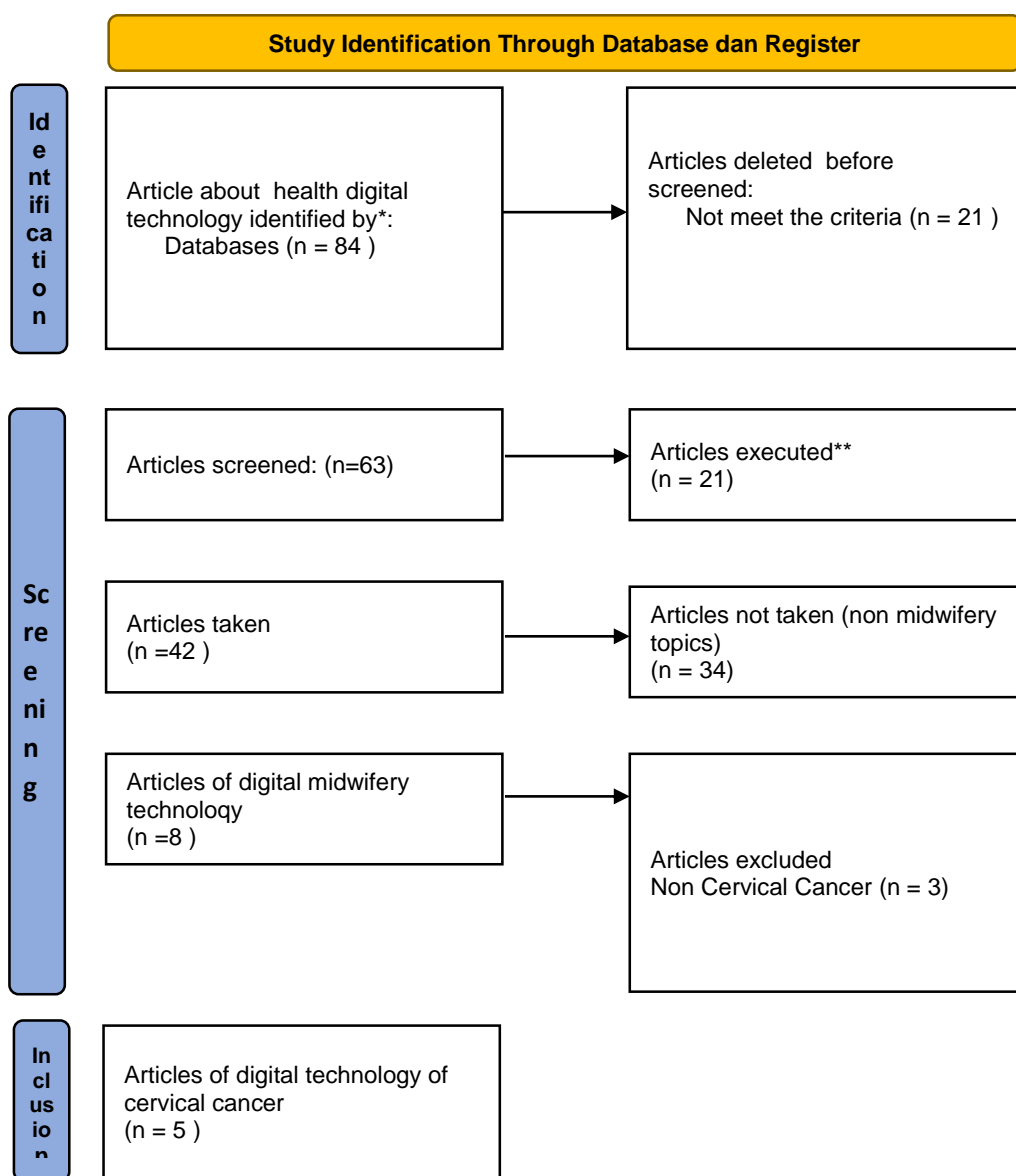


Figure 3. Data Collection Methods

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 Inspection with Acetic Acid: an Innovative tool to improve Cervical Cancer Screening in Low-Resource Setting (8)	Visual 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	Visual methods of IVA and cervicography were similar and accurate

International Journal
Gynaecology Obstetri 2005
May, 89 (2): 120-6 (14)

- 4 Digital cervikography The Burden of Cervical pre-cancer and cancer in HIV positive women in Zambia: modeling study (15) Digital cervikography, cytology and histology results might identify cervical disease
Allen C Bateman etc
BMC Cancer (2015) 3:541 pm
- 5 eC₃ (electronic cervical cancer control) eC₃ – a Modern Telecommunications Matrix for Cervical Cancer Prevention in Zambia eC₃ was an appropriate technology to bridge the gap between screening and diagnosis. Molecular human papillomavirus-based screening and wireless telemis communication
Parham GP etc. PMC. 2013 (16)

Midwifery technology articles

- 6 Assited Reproductive Technology (ART) Assited 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) Gynecologic Survivor Tool: Development, Implementation and Symptom Outcomes Carter J etc. JCO an American Society of Clinical Oncology As electronic reporting of the patients, GST was eligible and time saving

- Journal. 2022
February;6:e2100154 (18)
- 7 Data check Inadequate clinical data on Pap Inadequate clinical data on
request form Test Request Form: Where are Pap test request forms due to
we headed in the era of a wide variety of factors
precision medicine?
Neeta Kumar, Ruchika Gupta,
Sanjay Gupta
Cyto Journal. 2020;17:1 (19)

IVA articles with no technology

- 8 Ordinary Eyes Cervical Cancer Screening- IVA results showed high
The Challenges of complete subjectivity, low
pathways of care in low-income performance, and limited
countries: Focus on Malawi *quality control*
Heather A Cuby, Christine
Campbell
Women Health 2020 (20)

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 cervicography 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

3. LAYOUT JOURNAL

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

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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 8th among Southeast Asia countries, and

become 23rd 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.

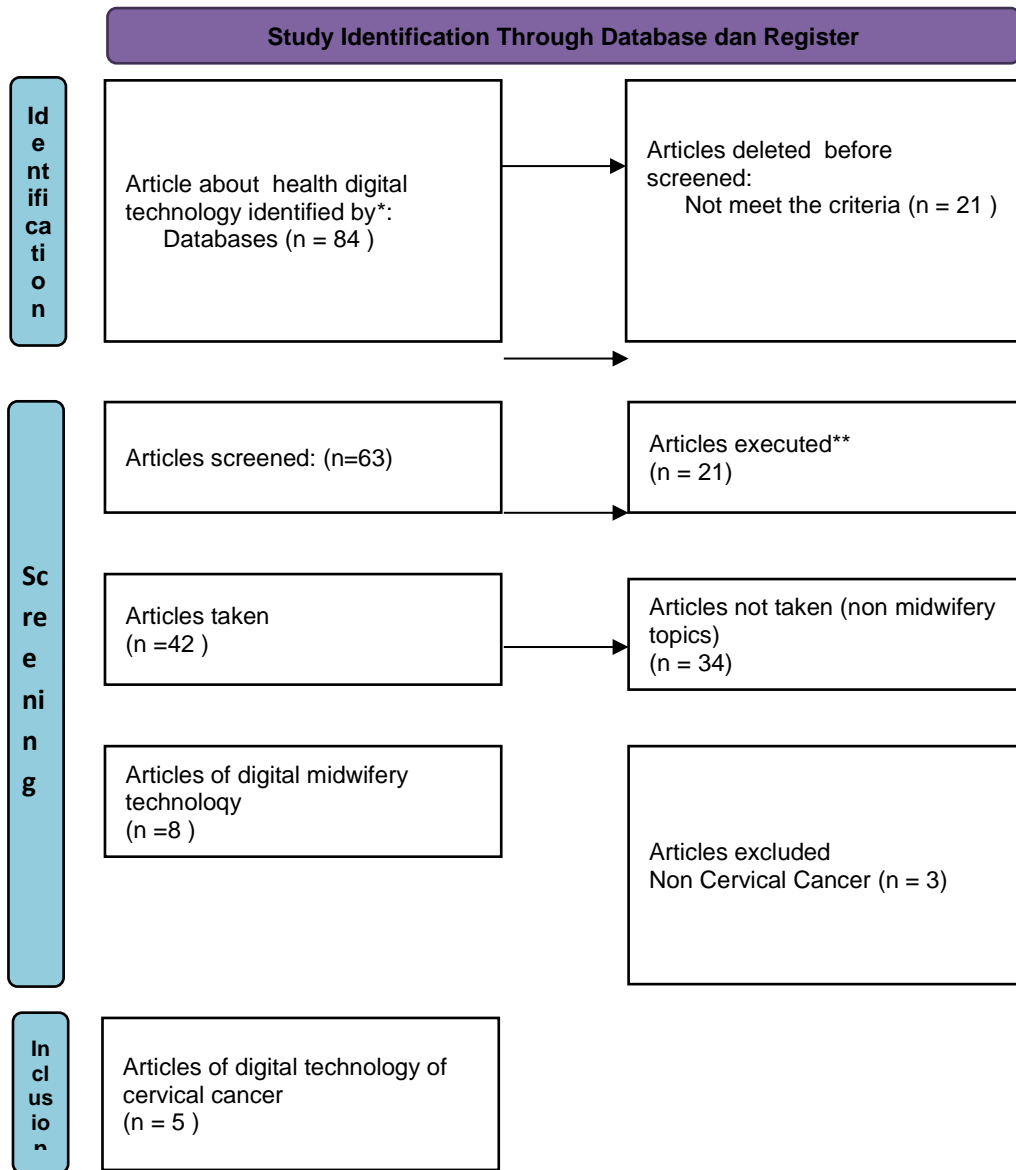


Figure 3. Data Collection Methods

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

6	Assited Reproductive Technology (ART)	Assited 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.
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7	Gyneologic Survivor Tool (GST)	Gynecologic 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
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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
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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
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