

Effect of Educational Program on Knowledge and Preventive Practices Regarding Cervical Cancer Screening and Human Papillomavirus Vaccine among Childbearing Women

Aya M. Abdelhafez¹, A.F. Abdel-Kawi², Safaa H Mohamed³, Alaa El-Din Mahmoud Ismail⁴, Walaa H. Ibrahim³

¹Lecturer of Maternity, Obstetrics and Gynecological Nursing, Faculty of Nursing, Assiut University, Assiut, Egypt.

²MD Assiut University & Marien Hospital Hamburg, Germany.

³Assistant Professor of Maternity, Obstetrics and Gynecological Nursing, Faculty of Nursing, Assiut University, Assiut, Egypt.

⁴Professor of Obstetrics and Gynecological Medicine, Faculty of Medicine, Assiut University, Assiut, Egypt.

Correspondence: Aya M. Abdelhafez

Email: aya@aun.edu.eg; Address

Abstract:

Background: Cervical cancer knowledge level and human papillomavirus vaccine was insufficient among women aged 20–45 years old, especially those of lower socio-economic condition. **Aim:** assess the effect of the educational program on knowledge and preventive practices regarding cervical cancer screening and human papillomavirus vaccine among childbearing women. **Methods:** a quasi-experimental pre and post-test design was used. **Sample:** a purposive sample of 135 women aged 18-44 years. Two tools were used to conduct this study. Tool (1): An interview questionnaire consisted of two parts: the first part involved personal, obstetrical, and family planning data, history of cervical cancer, pap smear testing, and HPV vaccine. The second part was the knowledge of cervical cancer, screening, and HPV vaccine. Tool (2) was the women's preventive practices regarding cervical cancer screening and the HPV vaccine. **Results:** The findings of this study illustrated that before intervention 8.1%, 12.6% & 23.7% of the participants had good knowledge, satisfactory practice & performed CC screening respectively. After intervention 73.3% of participants had good knowledge, 82.2% and 98.5% of them had satisfactory practice and performed CC screening respectively (p-value <0.01). **Conclusion:** a structured educational intervention substantially improved knowledge and influenced practice changing of participants regarding cervical cancer screening and HPV vaccination. **Recommendations:** the establishment of nationwide education programs, as well as screening programs, and raising awareness campaigns to improve access to cervical cancer prevention services were recommended.

Keywords: Knowledge, Practices, Cervical Cancer Screening, Human papillomavirus vaccine, Childbearing Women.

Introduction

Cervical Cancer (CC) is a disease that can be prevented. If identified early and treated adequately, it can potentially be cured. However, it continues to be one of the most prevalent forms of cancer and the leading cause of cancer-related death among women worldwide **(Believe, Omosivie, Soter & Adekunbiola, 2022)**. CC ranks as the fourth most widespread cancer among women globally and is the second most prevalent type of cancer in Low and Middle-Income Countries (LMICs) following breast cancer. In 2020, there were approximately 604,127 new cases and 341,831 deaths attributed to CC **(Bruni et al., 2023; Kindi et al., 2024)**. These data account for 7.5% of all deaths caused by female cancers. The incidence of the disease is on the rise in nearly every sub-Saharan African nation. Cervical cancer is the primary cause of cancer mortality among women in eastern, western, central, and southern Africa. Out of the estimated annual deaths of over 311,000 from CC, more than 85% occur among young and less educated women **(Akinola & Constance, 2021; Walz et al., 2022)**. The World Health Organization (WHO) reports that the incidence rate of CC in low- and middle-income countries is almost twice that of high-income countries, with the mortality rate being three times worse **(Choe, Yoo, Akhmedova, Yusupov & Bolormaa, 2023)**. Yearly in Egypt, approximately 1,320 new cases of CC are identified. CC ranks as the 12th leading cause of death from cancer in women. There are an estimated 744 deaths attributed to CC annually, (estimations for the year 2020) **(Bruni et al., 2023)**.

Globally, the annual incidence of new cases of CC will rise from 570,000 to 700,000 over the next 12 years (2018 to 2030). Over the same period, the yearly deaths due to cervical cancer are to rise from 311,000 to 400,000 **(Zhao et al., 2021)**.

Human papillomavirus (HPV) is a sexually transmitted infection. Various strains of HPV are linked to both benign and malignant disorders affecting the anogenital regions and oropharynx. These viruses are highly prevalent, and it is likely that a majority of women worldwide are infected with at least one type of virus during their sexual lifetime **(Believe et al., 2022)**. Almost all instances of CC are likely to be associated with HPV infection. HPV types 16 and 18 account for 70% of CC and pre-cancerous cervical lesions **(Akinola & Constance, 2021; Bruni et al., 2023)**. Additional factors contributing to increased risk of CC encompass poor socioeconomic status, tobacco consumption, prolonged utilization of oral contraceptives, early marriage (before 18 years of age), sexual intercourse at a young age, sexual relations with multiple partners, multiparity, weakened immune system, and being overweight or obese **(Choe et al., 2023; Kindi et al., 2024)**.

The Cervarix vaccination has been proven to be an effective preventive vaccine for women who have not yet become sexually active, particularly those between the ages of 9 and 26 who have not been infected with HPV 18 and 16. The Cervarix vaccine is widely recognized for its high efficacy, immunogenicity, and safety in preventing over 70% of CC cases globally **(Drokow et al., 2021)**.

Cervical cancer is frequently asymptomatic, and the period between the onset of HPV infection and the progression to high-grade cervical neoplasia and invasive carcinoma may take around 15 years (Al Ghamdi, 2022). HPV testing effectively detects precancerous cervical lesions. It is essential and advised by WHO and the European guidelines to undergo testing for high-risk HPV and CC screening for the quality assurance of CC screening (Akinola & Constance, 2021).

Obstacles to the acceptance of HPV vaccine and Pap smear tests include educational barriers, lack of knowledge and awareness, high cost of screening and vaccination, lack of support from spouses, misperceptions, stigma, and modesty concerns, cultural beliefs and practices, and limited access to healthcare facilities (Zheng, Wu & Zheng, 2021). These obstacles particularly affect females in rural areas. Providing an educational intervention to raise awareness, knowledge, and understanding of CC and screening among women will be a crucial step in boosting women's health as it can empower women to enhance their motivation to get screening (Believe et al., 2022).

Significance of the study:

The organized efforts in several countries to implement HPV testing, vaccination, and testing for CC, have become a crucial objective because of the significant reduction in both the occurrence and the death rate of cervical carcinoma (Drokow et al., 2021).

In Egypt, there is an overall lack of well-structured national programs. Nevertheless, the rising prevalence of

HPV necessitates the implementation of a nationwide screening program. As the screening coverage is insufficient, It is necessary to incorporate a consistent CC screening program within an existing healthcare system that takes into account the obstacles women face in accessing healthcare (Choe et al., 2023). A few studies have investigated the extent of knowledge and practice among Egyptian women about CC screening and HPV vaccination.

In Egypt, it is essential to develop education programs and apply effective screening methods to ensure the feasibility, sustainability, effectiveness, and successful implementation of preventative measures against CC and HPV infections. Moreover, to fully get the advantages of these, it is imperative to offer suitable education to the general population.

Aim of the study

The present study aimed to establish an educational program and assess its effect on knowledge and preventive practices regarding cervical cancer screening and human papillomavirus vaccine among childbearing women and identify the effect of it on performing a pap smear.

Research hypothesis

H1:- The application of the educational program is effective in improving knowledge and preventive practices regarding CC screening, HPV vaccine, and performing a pap smear among childbearing women.

H0:- The application of the educational program is not effective in improving knowledge and preventive practices regarding CC screening, HPV vaccine, and performing a pap smear among childbearing women.

Subject and methods

Study design and setting

An experimental study design, known as a pre-post Quazi design, was conducted in the outpatient clinic of the Woman Health Hospital at Assiut University, Assiut, Egypt, between December 2023 and June 2024. This hospital is a tertiary healthcare facility that serves patients from various regions in Upper Egypt.

Study participants and recruitment strategy

A purposive sample of 135 women with the following inclusion criteria: aged between 18-44 years, attended the clinic for various reasons during the study period, and agreed to participate in the study. Exclusion criteria: women with acute medical emergencies, serious illnesses, mental disorders, and those with no time to participate in the study were ineligible to participate.

Sample size determination

According to the sample size equation, it was found that a minimum of 135 participants is required, considering a 10% non-response rate adjustment. The sample was computed based on the following equation:

$$n = \frac{DEFF * N_p (1-p)}{[(d^2/Z^2(1-\alpha/2)^*(N-1) + p*(1-p))]}$$

$$DEFF \text{ (Design effect)} = 1$$

$$N \text{ (population)} = 4800$$

$$p \text{ (Hypothesized \%)} = 10\% \pm 5$$

$$d \text{ (tolerated margin of error)} = 0.05$$

$$Z \text{ (level of confidence)} = 1.96$$

$$\alpha \text{ (Alpha)} = 0.05$$

$$n = \frac{[1 * 4800 * 10\% \pm 5 (1 - 10\% \pm 5)]}{[(0.05)^2 / (1.96)^2 - 0.05 * (4800 - 1) + 10\% \pm 5 (1 - 10\% \pm 5)]}$$

$$n = 135 \text{ participants}$$

Data collection tools

Two tools were used for data collection.

Tool (1): An interview questionnaire adapted by the researchers after

reviewing the related literature (Mukosha et al., 2023; Perkins et al., 2021; Usman et al., 2023). It included two parts: part (1) was divided into section one comprised of personal data such as age, occupation, residence, and level of education. Another section included gravidity, parity, previous abortion, mode of the last delivery, and using any family planning methods. The last section had a history of CC as a family history of CC, performed pap smear or HPV testing, and received an HPV vaccine. Part (2) contained the knowledge about CC screening and HPV vaccine as general knowledge about CC and its screening, risk factors, symptoms, prevention of CC, and knowledge about HPV and its vaccine.

Knowledge scoring system:

The knowledge encompassed 45 items. Each item was assigned a score of (1) for a correct and (0) for a wrong or unknown response. The total score varied from 0 and 45. The overall knowledge score was computed as good knowledge if the score was >70 % (> 32), average knowledge was 50-70 % (13-32) and poor was less than 50% (12 or less).

Tool (II) was the preventive practices regarding CC screening which involved questions to assess actions done regarding CC screening as ever screened or tested for CC, previous performance of Pap smear, women's current performance of pap smear, and intention to receive vaccine against HPV (Mukosha et al., 2023; Usman et al., 2023).

Preventive practice scoring system:

The total score of the practice consisted of 7 items. Each item was assigned a score of (1) for done and (0) for not done. The overall score ranged between 0

and 7. The total practice score level was determined using the following: The practice was considered satisfactory if the score was $\geq 70\%$ (≥ 5) and unsatisfactory if less than 70%.

Supportive materials:

The researchers prepared the educational materials based on reviewing the relevant & recent literature (**Kakotkin, Semina, Zadorkina & Agapov, 2023; Perkins et al., 2021**). It was designed in the form of an English brochure and then translated into a simple and clear Arabic language as well as smartphone photos and videos were used to facilitate training on CC screening and HPV vaccination. The definition, risk factors, signs, and symptoms, prevention of CC, HPV meaning, HPV Transmission, the relation of HPV and CC and HPV vaccine effectiveness, administration, recommended age, vaccine safety, side effects, and importance of regular screening were discussed in the instructions.

Tools Reliability:

The Cronbach Alpha coefficient was calculated for the instrument, revealing values of 0.943 and 0.817 for knowledge and preventive practice related to CC screening, respectively.

Tools Validity

A panel of three specialists in obstetrics & gynecological nursing and medicine examined the tools for clarity and comprehensiveness.

Pilot study

A pilot study was done on 10% (14) of women based on the inclusion criteria to evaluate the clarity and feasibility of the tool. No modifications were made to the tool; thus, the sample was incorporated into the total sample.

Data collection procedure

Data was gathered from December 2023 to the end of June 2024. The data-acquiring process comprised three phases: pre-intervention, intervention, and post-intervention. During the pre-intervention phase, approval from the ethical committee of the Faculty of Nursing, Assiut University, (Approval No: 1120230705), and official agreement from the manager of the Woman's Health Hospital was secured to begin this study. After obtaining informed consent from the participating women, the researcher introduced herself and explained the study goal. The researcher told the women that they were free to withdraw from the study at any stage. The participants' anonymity and confidentiality were always ensured, the researcher conducted individual interviews with each participant in a separate room to ensure confidentiality, collecting data on the women's personal characteristics, obstetric history, and family planning data. The interventional phase involved the implementation of an educational program regarding CC screening and HPV vaccination. The researcher provided education to each small group of women, consisting of 2 to 4 participants, over 4 sessions, with each session lasting approximately 15 to 20 minutes. The initial session aimed to establish rapport between the researchers and women to reduce their fear and gain their trust. In the second session, a pretest was conducted to evaluate their knowledge and practices of CC prevention through using knowledge and preventive practice tools. In the third session, the studied women were provided with an educational program. An instructional support brochure was disseminated to the participating women.

Programs were provided to the women through lectures, discussions, demonstrations, and videos. The sessions were carried out during the waiting period of the women undergoing clinical assessment at the gynecological clinic. In the fourth session, after the education session ended, knowledge and preventive practices concerning CC screening and HPV vaccination were assessed to measure the impact of the education. Finally, after the education women were assessed for their screening status (performing a pap smear) and their intention to receive the HPV vaccine.

Statistical analysis:

The gathered data were cleaned, entered, and analyzed with the Statistical Package for the Social Sciences (SPSS) version 26. Data were presented as numbers, percentages, means, and standard deviation. The McNemar, Pearson, and chi-square tests were employed to demonstrate the relation between variables. A T-test was used to compare the means, with a p-value being statistically significant when $p < 0.05$.

Results

Table (1) illustrates the women's personal characteristics and demonstrates that 49.6% of them are aged between 20 and 30 years with a mean \pm SD 31.88 ± 6.657 , about 77.0% and 57.8% of them are housewives and from rural areas respectively. Regarding education, 54.1% of the women are illiterate or read & write.

Table (2) shows the participants' obstetrics and family planning history and reports that 65.9% of them are multigravida and primipara, and about 27.4% and 71.1% of them have previous abortion and cesarean section respectively. Regarding using any FP

method, 46.7% of the participants used the family planning method.

Table (3) clarifies that 12.6% of the participants have a family history of CC and received the HPV vaccine, and about 17.0% of them had a history of performing a pap smear.

Table (4) demonstrates that a highly statistically significant difference exists between mean \pm SD before and after intervention, regarding general knowledge about CC and its screening, knowledge about CC risk factors, symptoms, prevention, and knowledge about HPV and its vaccine (P-value < 0.01).

Figure (1) shows that before intervention 8.1% of the women exhibited good knowledge, whereas 68.9% showed poor knowledge. After the intervention, 73.3% & 5.9% of women exhibited good knowledge and poor knowledge respectively, with a statistically significant difference observed before and after the intervention with a p-value < 0.01 .

Figure (2) illustrates that before intervention 12.6% of the women have a satisfactory practice. After intervention, 82.2% of the women have a satisfactory practice, with a highly statistically significant difference between before and after intervention with p-value < 0.01 .

Figure (3) shows that before intervention 23.7% of the women had performed CC screening. After intervention, 98.5% of the women performed CC screening (a Pap smear), with a highly statistically significant difference between before and after intervention at p-value < 0.01 .

Table (5) shows that before the intervention, 15.6% of participants expressed an intention to receive the HPV vaccine; and 74.1% after the

intervention, demonstrating a highly statistically significant difference (p-value 0.001). Table (6) illustrates the correlation between the participants' total knowledge score, their personal data, and obstetric history before and after the intervention, it reported that there is a positive correlation between the participants' age and educational level before intervention, and parity and their total knowledge score after intervention.

Table (7) shows the correlation between the participants' total preventive practice score, their personal data, and obstetric history before and after the intervention, it reported that a positive correlation exists between the participants' educational level and previous abortion before the intervention, and employment and their total preventive practices score after the intervention.

Figure (4) shows that there is no statistically significant relation between the participants' total knowledge and preventative practices score before the intervention, with a p-value > 0.05 . However, after the intervention, a statistically significant relation was seen between the participants' total knowledge and practice score, with a p-value < 0.05 .

Table (1): participants' personal characteristics (n = 135)

Personal data	N	%
Age/years		
Less than 20	2	1.5
20-30	67	49.6
31-44	66	48.9
Age (mean± SD)	31.88±6.657	
Occupation		
Housewife	104	77.0
Employed	31	23.0
Residence		
Urban area	57	42.2
Rural area	78	57.8
Level of education		
Illiterate or read & write	73	54.1
Secondary education	35	25.9
University education	27	20.0

Table (2): obstetrics & family planning history of the participants (n= 135)

Item	N	%
Gravidity		
Non	5	3.7
Primigravida	41	30.4
Multigravida	89	65.9
Parity		
Non	11	8.1
Primipara	89	65.9
Multipara	35	25.9
Previous abortion		
Yes	37	27.4
No	98	72.6
Mode of the last delivery		
Non	11	8.1
Normal	28	20.8
Cesarean section	96	71.1
Using any FP method		
Yes	63	46.7
No	72	53.3

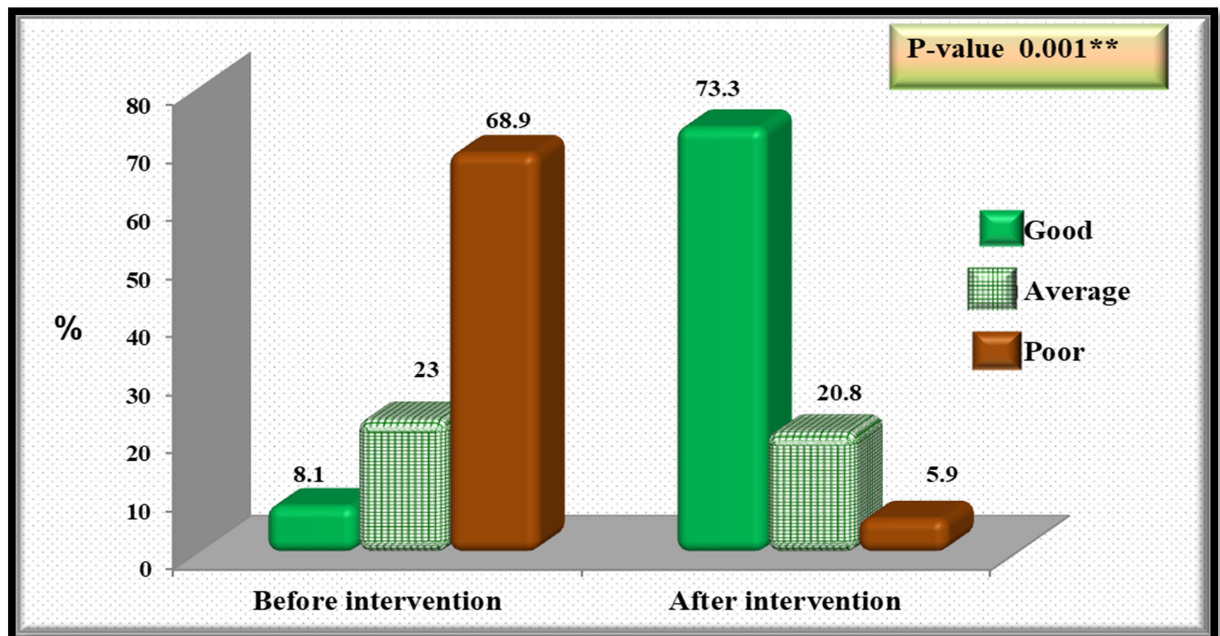
Table (3): cervical cancer history of the participants (n=135)

Cervical cancer history	N	%
Family history of cervical cancer		
Yes	17	12.6
No	118	87.4
Perform pap smear		
Yes	23	17.0
No	112	83.0
Received HPV vaccine		
Yes	17	12.6
No	118	87.4

Table (4): mean and SD of total women’s knowledge of CC screening and HPV vaccine before and after intervention (n=135)

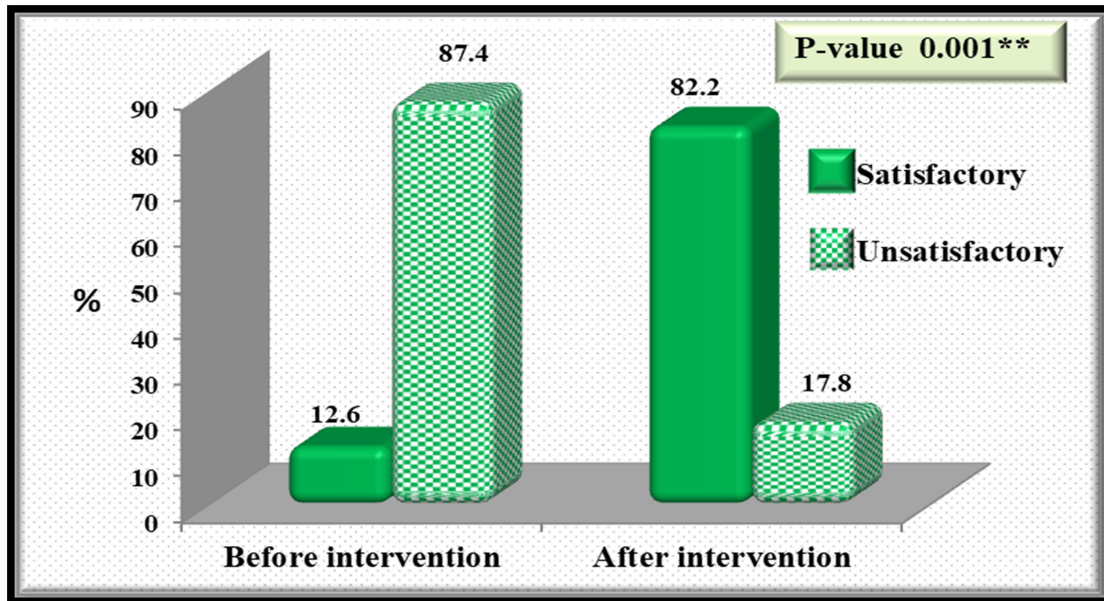
Item	Mean and SD		P-value
	Before intervention	After intervention	
General cervical cancer knowledge and cc screening	2.85±3.355	8.556±2.987	0.001**
Knowledge about risk factors	1.689±2.342	5.289±2.129	0.001**
Knowledge about symptoms of cervical cancer	1.97±2.504	6.244±1.998	0.001**
Knowledge of cervical cancer prevention	1.778±2.275	5.126±1.948	0.001**
Knowledge about HPV and its vaccine	2.437±3.413	9.207±3.129	0.001**
Total knowledge	10.733±12.09	34.42±10.491	0.001**

t-test (**) a highly statistically significant difference



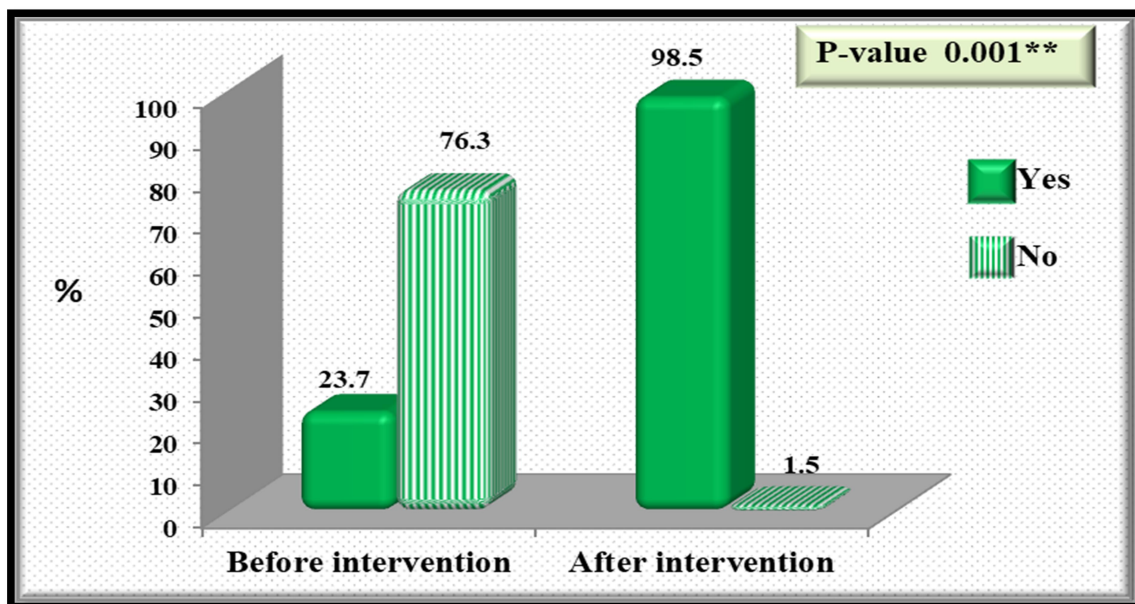
McNemar test

Figure (1): the participants’ total knowledge level of cervical cancer before and after intervention (n=135)



McNemar test

Figure (2): the participants' total preventive practice level of cervical cancer screening before and after intervention (n=135)



McNemar test

Figure (3): the participants' performing of the cervical cancer screening before and after intervention (n=135)

Table (5): the participants’ intention to receive HPV vaccine before and after intervention (n=135)

Intention to receive HPV vaccine	Before intervention		After intervention		P-value
	N	%	N	%	
Yes	21	15.6	100	74.1	0.001**
No	114	84.4	35	25.9	

McNemar test

Table (6): correlation between total knowledge score and personal data, and obstetric history of the participants before and after intervention (n=135)

Personal data		Before intervention	After intervention
Age/years	Pearson Correlation	-.183	.075
	Sig. (2-tailed)	.034*	.387
Employment	Pearson Correlation	.063	.013
	Sig. (2-tailed)	.466	.878
Residence	Pearson Correlation	.098	-.089
	Sig. (2-tailed)	.258	.305
Level of education	Pearson Correlation	.401	-.049
	Sig. (2-tailed)	.000**	.575
Gravidity	Pearson Correlation	-.032	.160
	Sig. (2-tailed)	.712	.063
Parity	Pearson Correlation	.003	.196
	Sig. (2-tailed)	.975	.023*
Previous abortion	Pearson Correlation	.122	.023
	Sig. (2-tailed)	.160	.791
Mode of the last delivery	Pearson Correlation	-.117	.004
	Sig. (2-tailed)	.178	.962
Using any FP method	Pearson Correlation	.154	.028
	Sig. (2-tailed)	.074	.749

Pearson test

(*) statistically significant difference

(**) a highly statistically significant difference

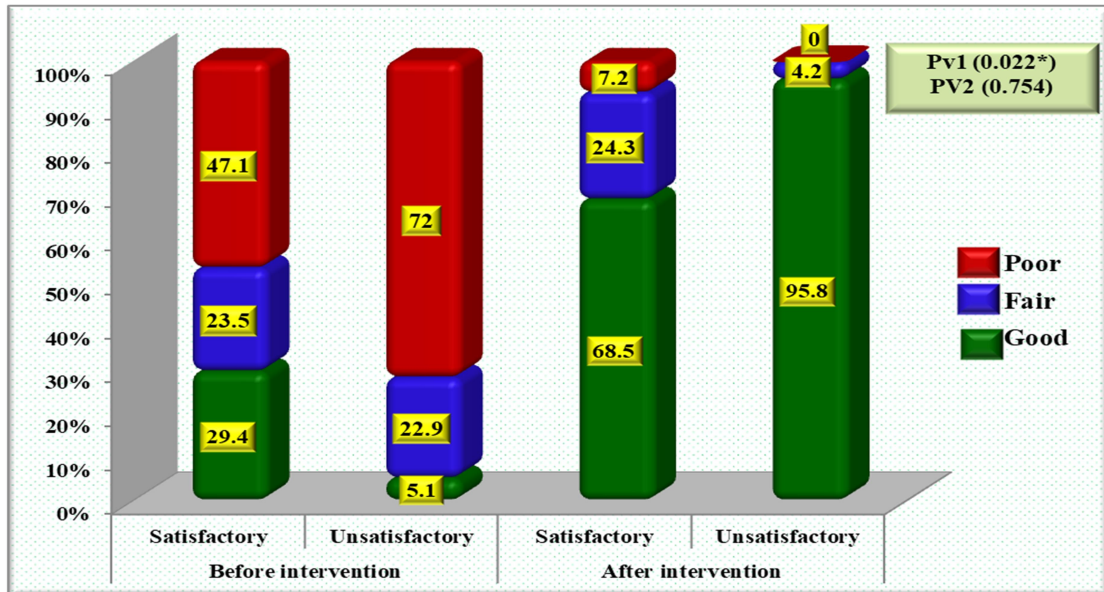
Table (7): correlation between the participants’ total preventive practice score and their personal data, and obstetric history before and after intervention (n=135)

Personal data		Before intervention	After intervention
Age/years	Pearson Correlation	-.080	.117
	Sig. (2-tailed)	.356	.175
Employment	Pearson Correlation	.051	.192*
	Sig. (2-tailed)	.560	.026
Residence	Pearson Correlation	.143	.084
	Sig. (2-tailed)	.097	.332
Level of education	Pearson Correlation	.195*	-.004
	Sig. (2-tailed)	.023	.961
Gravidity	Pearson Correlation	-.118	.096
	Sig. (2-tailed)	.173	.270
Parity	Pearson Correlation	-.060	.038
	Sig. (2-tailed)	.490	.660
Previous abortion	Pearson Correlation	.237**	-.072
	Sig. (2-tailed)	.006	.403
Mode of the last delivery	Pearson Correlation	-.038	.075
	Sig. (2-tailed)	.659	.390
Using of any FP method	Pearson Correlation	-.063	-.078
	Sig. (2-tailed)	.467	.372

Pearson test

(*) statistically significant difference

() a highly statistically significant difference**



Chi-square test

PV1 (between total knowledge and practices score before intervention)

PV2 (between total knowledge and practices score after intervention)

Figure (4): Relation between the participants' total knowledge and preventive practices score before and after intervention (n=135)

Discussion

In Egypt, For years, the country lacked established CC screening programs, and Pap smear testing is limited to tertiary healthcare facilities only for diagnostic purposes (Kindi et al., 2024; Ortashi & Alkalbani, 2020). Egypt lacks a national HPV vaccination program, despite the association between HPV infection and CC. Public awareness of CC and its importance is crucial for early identification and prevention (Bruni et al., 2023; Kindi et al., 2024; Said, Hassan & Sarhan., 2018). So, in June 2023, Egypt's Minister of Health and Population launched the first phase of the cancer early detection presidential initiative, offering free services for lung, prostate, colon, and CC, as part of the "100 Million Healthy Lives" campaign (<https://beta.sis.gov.eg/en/projects-initiatives/initiatives/early-detection-of-cancer-tumors/>). Thus, the current study was conducted to establish an educational program and assess its effect on knowledge and preventive practices regarding CC screening and HPV vaccine among childbearing women and identify the effect of the educational program on performing a pap smear.

The study findings indicated significant improvement in the knowledge of CC, screening, HPV, and its vaccine, with around three-fourths of participants having good knowledge after the intervention compared to less than one-tenth before intervention (p -value <0.01). Regarding their preventive practice level, four-fifths of the participants had satisfactory practice after intervention and only one-eighth before intervention. As regards women's intention to receive an HPV vaccine and perform a Pap smear, the vast majority of them performed a Pap smear, and about

three-fourths intended to receive an HPV vaccine after intervention. Concerning the correlation between the participants' total knowledge score, their personal data, and obstetric history before and after intervention, women's age and educational level before intervention and parity after intervention correlated positively with their total knowledge score. According to women's total practice score, educational level, previous abortion before intervention, and employment after intervention correlated positively with their total practice score. Women's total knowledge and practice scores were related before intervention. While after intervention no relation was present between the total knowledge and practice scores.

In the current study, after intervention less than Three-Fourths of the participants had good knowledge of CC, screening, HPV, and its vaccine, and more than four-fifths had satisfactory practice. A study conducted in Egypt by Said et al. (2018) found similar results, confirming that the educational intervention successfully enhanced women's knowledge and attitude toward CC. Said et al., (2018), study was conducted in Egypt but on a small sample of 65 women and in a different city away from the city that the current study conducted. Although, women's characteristics may differ from one city to another. Both studies agreed on the effectiveness of the educational intervention in improving women's knowledge and attitude toward CC screening and HPV vaccination. El-Kurdy, HamedMohammed, Ali, Fadel og Mohamed (2021), In Egypt, revealed that women who joined a program based on the Health Belief Model (HBM) showed increased knowledge and more

positive beliefs about preventing CC after the program, compared to before. Using a cluster-randomized study of fourteen primary health care clinics by Thiel de Bocanegra, Dehlendorf, Kuppermann, Vangala og Moscicki (2022), demonstrated that women who were observed in intervention clinics had higher levels of knowledge regarding HPV and a better understanding of CC screening in comparison to women who were observed in control clinics. A study performed on pregnant women in Saudi Arabia proved that educational intervention effectively enhanced awareness and knowledge of CC, as well as its screening, while also diminishing obstacles to the HPV vaccination, **Almutairi et al. (2022)**. The same results were found in Nigeria, by **Believe et al. (2022)**, the individual who concluded that the percentage of women owning a high level of knowledge regarding CC and HPV increased from about one-tenth to the vast majority and from less than one-tenth to majority between pre and post health education respectively. **Drokow et al. (2021)**, found that before the intervention, most participants possessed some knowledge of CC, which increased to a hundred percent following the intervention ($P < .001$). **Somera et al. (2023)**, performed a study in the U.S., revealing that educational intervention proved to be a successful method for enhancing knowledge and awareness regarding CC, HPV, and its vaccination, but this study was carried out on a cohort of university students. In a prior study conducted in Oman by **Kindi et al. (2024)**, within a group of Omani women visiting a specialized clinic, it was found that their knowledge of CC and Pap smear screening was lacking. In which, the majority and more than half of the

participants only heard of CC and Pap smear testing respectively. Furthermore, about one-fourth of the women had a good level of knowledge about these issues. According to **Nasar, Waad, Atheer og Nasra (2016)**, in Oman, the majority of the participants heard about CC, but their specific knowledge, such as its risk factors and the Pap smear, was generally lacking. **Shamaun et al. (2023)**, Pakistan noticed a lack of awareness of cervical cancer, HPV vaccine, and cervical screening among women. less than half, about one-third, and just 1.8% of women knew CC, cervical screening, and HPV vaccine respectively, the overwhelming majority lacked awareness of the risk factors associated with CC. Just one-sixth of them possessed a previous history of cervical screening. Around one-third showed intention to obtain the screening. In the US, about three-fourths vs the majority of the reproductive age group in an HIV hotspot, indicated that they had undergone HPV/Pap smear screening. It was observed in both the groups who had and had not received the HPV vaccine (**Villavicencio et al., 2023**). Although the outcomes of this study indicated that women of reproductive age had low vaccination rates and inadequate information about HPV in their communities in the US. This level of public awareness is high compared to our communities, possibly because of the culture, education, and healthcare system differences. Also, a systematic review done in the USA by **Washington et al. (2024)**, about the effectiveness of health education interventions for preventing CC in rural communities. The findings of this study found that the intervention mattered in increasing CC screening participation of women. **Winarto et al. (2022)**, on

Indonesian urban citizens in Jakarta, proved that while the individual knowledge of the questions asked is lacking, there is moderate overall knowledge. The inquiry shows a positive attitude both in each aspect and overall. However, the practices are unsatisfactory, with about half of the women having good knowledge, the majority of them expressing a positive attitude, and more than one-third applying favorable practices regarding the questions asked. In 6 provinces of China, **Gao, Zhao, Di, Zhang og Wang (2018)**, showed that over half of women had a low level of knowledge regarding cc and HPV vaccination, with less than one-tenth providing the right answers to all questions. The study conducted by **Gao et al. (2018)**, reported that women between the ages of 20 and 45, particularly those with lower socio-economic status, still had inadequate knowledge about CC and the HPV vaccine. A study conducted by **Morhason-Bello, Kareem og Adewole (2020)**, in Ibadan, Nigeria, concluded that women's knowledge about CC risk factors, causes, and prevention was insufficient. The current study results concerning knowledge of women before intervention was only 8.1%, which disagreed with a study done in Medina, Saudi Arabia, **Jeddo (2022)**, which revealed that the participants' levels of awareness of CC and Pap smear were higher than three-fourths & less than half respectively. However, it is in line with the current study in the percentage of participants who have had a Pap smear and heard about HPV, one-sixth & around one-fourth respectively. Although, Saudi Arabia is an Arabic country like Egypt. The disagreement in some knowledge between both studies may come from cultural and educational levels. Also, the variations observed among

Middle Eastern countries sharing a comparable sociocultural background can be attributed to the presence of Pap smear testing in most primary health centers, which is a result of the country's well-woman clinic program. A lot of studies have been conducted in many countries across the world to assess the knowledge of CC, its screening, HPV, and its vaccination on students, healthcare workers, and women, almost all those studies agreed that the presence of low knowledge, awareness and the majority of them agreed that unsatisfactory attitude and practice present. Also, all studies agreed on the role of educational intervention in improving the knowledge and practice of women concerning preventing CC and HPV vaccination.

The current study results illustrated that after the intervention, the vast majority of women performed a pap smear, and nearly three-fourths were intended to receive the HPV vaccine. This was in line with **Drokow et al. (2021)**, whose study reported that after the educational intervention the intention to have a pap smear test improved from about one-third to the majority and the intention to be vaccinated increased from less than half to majority of participating women. **Winarto et al. (2022)**, mentioned that high knowledge, attitudes, and practice significantly impact the completion of one vaccination dose and the intention to obtain further vaccinations. Similarly, in China, **Gao et al. (2018)**, said that the level of information significantly correlated with the readiness to receive the HPV vaccine. In the present study, women's total knowledge and preventive practice scores were related before intervention. Also, in Jakarta, Indonesia, **Winarto et al. (2022)**, study revealed a moderate correlation ($\rho =$

0.485) between knowledge and practice. However, after the intervention, because the total knowledge and practice were increased, the current study concluded that no relation was found between them. Comparable findings about the correlation between women's CC screening knowledge and practice in **Uzbekistan by Choe et al. (2023)**, observed that having sufficient knowledge about HPV and CC prevention may not be enough for CC screening practices.

The women's total knowledge score was positively correlated with their age and educational level before intervention and only with parity after intervention. A positive correlation between women's total practice score and educational level, previous abortion before the intervention, and employment after the intervention was present in the current study. These findings partially were in alignment with **Winarto et al. (2022)**, who revealed that the factors associated with good knowledge were female sex (OR = 2.99) and higher level of mother's education (OR = 2.15). The factors that indicated improved practices included female sex (OR = 2.33), employment (OR = 1.68), high knowledge levels (OR = 4.56), and displaying good attitudes (OR = 8.05). This partial difference may be due to the difference in sample size and participant characteristics among both studies. Also, some differences from our study found by **Gao et al. (2018)**, in which their study revealed that the region, age group, occupation, education level, monthly family income, and gravidity were all substantially associated with a high knowledge level. In Medina, Sadia Arab, there was no significant correlation between socioeconomic factors and CC knowledge or its screening (**Jeddo,**

2022). This may be due to many reasons as the difference in region, cultural differences, sample size, and women's characteristics.

No doubt that many studies were conducted among patients, students, women, health care providers, and employees in different settings and countries to assess and raise CC awareness, its screening and prevention, HPV, and vaccination. Despite all those, we still need more and more research to emphasize the crucial impact of education promoting awareness that could aid in early CC detection and prevention of late diagnosis and related complications, including deaths, and motivate asymptomatic women to be screened. Public health efforts should focus on appropriate measures to educate the population and increase HPV knowledge among women to increase vaccine uptake.

Conclusion and recommendations

In conclusion: the outcomes of the current study indicated that participants at one of the largest tertiary healthcare institutions in Upper Egypt had insufficient knowledge about CC and HPV vaccination. Also, this study indicated that utilizing a structured educational intervention substantially improved knowledge and influenced the preventive practice-changing of women regarding CC screening and HPV vaccination. Thus, it is recommended to establish nationwide educational initiatives, screening programs, and awareness campaigns to enhance access to CC prevention services for women. This will help prevent CC and other health conditions related to HPV and remove obstacles to HPV vaccination. The current study also recommends that it is important to educate women's partners and involve them in the study. Additionally, including

measures of behavioral outcomes and the intention to receive vaccinations or screenings may lead to more comprehensive future studies.

ACKNOWLEDGMENT

The researchers express their gratitude to the women who willingly took part in this study and devoted their time to engage in pre- and post-health education activities.

Ethics approval and consent for participation

The study protocol was reviewed and received approval from the Ethical Committee of the Faculty of Nursing, Assiut University, (Approval No: 1120230705). All participants in the study provided informed consent.

References

- Akinola, A. & Constance, M. S. (2021). Impact of educational intervention on cervical cancer screening uptake among reproductive age women. *International Journal Of Community Medicine And Public Health*, 8(4). doi: 10.18203/2394-6040.ijcmph20211280
- Al Ghamdi, N. H. (2022). Knowledge of human papilloma virus (HPV), HPV-vaccine and pap smear among adult Saudi women. *J Family Med Prim Care*, 11(6), 2989-2999. doi: 10.4103/jfmpe.jfmpe_2094_21
- Almutairi, S. H., Alsedrah, S. A., Almutairi, K. S., Albayyahi, Y. R., Almutairi, O. M. & Alamri, H. M. (2022). The impact of education intervention on awareness of cervical cancer and barriers to HPV vaccination among Saudi pregnant women. *Medical Science*, 26, 1-13.
- Believe, O., Omosivie, M., Soter, A. & Adekunbiola, B. (2022). Effect of Health Education on the Knowledge of Cervical Cancer, Human Papillomavirus and Self-sampling Among Women in a Low- Resource Setting. *European Journal of Medical and Health Sciences*, 4(3), 145-151. doi: 10.24018/ejmed.2022.4.3.1316
- Bruni, Albero G, Serrano B, Mena M, Collado JJ, Gómez D, Muñoz J, Bosch FX & S., d. S. (2023). ICO/IARC Information Centre on HPV and Cancer (HPV Information Centre). Human Papillomavirus and Related Diseases in Egypt. Summary Report.
- Choe, S.-A., Yoo, Y. J., Akhmedova, M., Yusupov, B. & Bolormaa, E. (2023). Human Papillomavirus Knowledge and Cervical Cancer Screening Practice among Uzbekistan Women. *Clinical and Experimental Obstetrics & Gynecology*, 50(1). doi: 10.31083/j.ceog5001004
- Drokow, E. K., Effah, C. Y., Agboyibor, C., Sasu, E., Amponsem-Boateng, C., Akpabla, G. S., Ahmed, H. A. W. & Sun, K. (2021). The Impact of Video-Based Educational Interventions on Cervical Cancer, Pap Smear and HPV Vaccines. *Front Public Health*, 9, 681319. doi: 10.3389/fpubh.2021.681319
- El-Kurdy, R., HamedMohammed, H., Ali, A. A. w. I., Fadel, E. A. & Mohamed, H. A. O. (2021). Effect of Program Based on Health BeliefModel on Women's Knowledge and Beliefs regarding Cervical Cancer Prevention. *Egyptian Journal of Health Care*, 12(4), 1700-1712.
- Gao, D., Zhao, G., Di, J., Zhang, X. & Wang, L. (2018). Knowledge of Cervical Cancer and HPV, and Willingness to Receive HPV Vaccination Among 20–45-Year-Old Women — Six Provinces, China, 2018. *CCDC Weekly*, 5(9), 201-205.

- <https://beta.sis.gov.eg/en/projects-initiatives/initiatives/early-detection-of-cancer-tumors/>. Hentet
- Jeddo, Z. A. (2022). Knowledge, perception, and sources of information towards cervical cancer and utilization of papanicolaou (pap) smear as screening among female in medina, Saudi Arabia. *Obstetrics & Gynecology International Journal*, 13(6), 378-383. doi: 10.15406/ogij.2022.13.00680
- Kakotkin, V. V., Semina, E. V., Zadorkina, T. G. & Agapov, M. A. (2023). Prevention Strategies and Early Diagnosis of Cervical Cancer: Current State and Prospects. *Diagnostics (Basel)*, 13(4). doi: 10.3390/diagnostics13040610
- Kindi, R. M. A., Sumri, H. H. A., Muhdhoori, T. M. A., Mamari, K. A., Kalbani, M. A. A. & Al-Azri, M. H. (2024). Knowledge of cervical cancer screening among Omani women attending a university teaching hospital: a cross-sectional study. *BMC Womens Health*, 24(1), 40. doi: 10.1186/s12905-023-02870-7
- Morhason-Bello, I. O., Kareem, Y. O. & Adewole, I. F. (2020). Modeling for Predictors of Knowledge Score on Etiology and Prevention Strategies for Cervical Cancer Among Women of Reproductive Age in Ibadan. *American Society of Clinical Oncology*, 6, 892-903.
- Mukosha, M., Muyunda, D., Mudenda, S., Lubeya, M. K., Kumwenda, A., Mwangi, L. M. & Kaonga, P. (2023). Knowledge, attitude and practice towards cervical cancer screening among women living with human immunodeficiency virus: Implication for prevention strategy uptake. *Nurs Open*, 10(4), 2132-2141. doi: 10.1002/nop2.1460
- Nasar, A., Waad, A., Atheer, A. & Nasra, A. (2016). Awareness of Cervical Cancer and Pap Smear Testing Among Omani Women. *Asian Pac J Cancer Prev*, 17(11), 4825-4830. doi: 10.22034/APJCP.2016.17.11.4825
- Ortashi, O. & Alkalbani, M. (2020). Cervical Cancer Screening in Arab Countries. I I. Laher (Red.), *Handbook of Healthcare in the Arab World* (s. 1-22). Cham: Springer International Publishing.
- Perkins, R. B., Guido, R. L., Saraiya, M., Sawaya, G. F., Wentzensen, N., Schiffman, M. & Feldman, S. (2021). Summary of Current Guidelines for Cervical Cancer Screening and Management of Abnormal Test Results: 2016-2020. *J Womens Health (Larchmt)*, 30(1), 5-13. doi: 10.1089/jwh.2020.8918
- Said, S. A. E., Hassan, H. E. & Sarhan., A. E. M. (2018). Effect of an Educational Intervention on Women's Knowledge and Attitude Regarding Cervical Cancer. *American Journal of Nursing Research*, 6(2), 59-66. doi: 10.12691/ajnr-6-2-4
- Shamaun, S., Jaleel, R., Gull, Y., Shahid, A., Iqbal, M. & Qazi, T. N. (2023). Knowledge and Attitude of Cervical Cancer Screening and Vaccination in Patients Attending Gynecology Outpatient Clinic at a Tertiary Care Hospital in Pakistan. *South Asian J Cancer*, 12(1), 17-22. doi: 10.1055/s-0042-1751093
- Somera, L. P., Diaz, T., Mummert, A., Badowski, G., Choi, J., Palaganas, H. & Ayson, K. (2023). Cervical Cancer and HPV Knowledge and Awareness: An Educational Intervention among

- College Students in Guam. *Asian Pac J Cancer Prev*, 24(2), 443-449. doi: 10.31557/APJCP.2023.24.2.443
- Thiel de Bocanegra, H., Dehlendorf, C., Kuppermann, M., Vangala, S. S. & Moscicki, A. B. (2022). Impact of an educational tool on young women's knowledge of cervical cancer screening recommendations. *Cancer Causes Control*, 33(6), 813-821. doi: 10.1007/s10552-022-01569-8
- Usman, I. M., Chama, N., Aigbogun, E. O., Jr., Kabanyoro, A., Kasozi, K. I., Usman, C. O., Fernandez Diaz, M. E., Ndyamuhakyi, E., Archibong, V. B., Onongha, C., Ochieng, J. J., Kanee, R. B. & Ssebuufu, R. (2023). Knowledge, Attitude, and Practice Toward Cervical Cancer Screening Among Female University Students in Ishaka Western Uganda. *Int J Womens Health*, 15, 611-620. doi: 10.2147/IJWH.S404845
- Villavicencio, A., Kelsey, G., Nogueira, N. F., Zukerberg, J., Salazar, A. S., Hernandez, L., Raccamarich, P. & Alcaide, M. L. (2023). Knowledge, attitudes, and practices towards HPV vaccination among reproductive age women in a HIV hotspot in the US. *PLoS One*, 18(1), e0275141. doi: 10.1371/journal.pone.0275141
- Walz, L., Mohamed, D., Haibah, A., Harle, N., Al-Ali, S., Moussa, A. A., Alawa, J., Awale, M. A. & Khoshnood, K. (2022). Knowledge, attitudes and practices concerning breast cancer, cervical cancer and screening among healthcare professionals and students in Mogadishu, Somalia: a cross-sectional study. *Ecancermedicalscience*, 16, 1455. doi: 10.3332/ecancer.2022.1455
- Washington, A., Smith, L., Anderson, G., Randall, J., Kayser, K. & LaJoie, S. (2024). A Systematic Review of the Effectiveness of Health Education Programs for Cervical Cancer Prevention in Rural Communities: Implications for Promoting Health Equity. *J Cancer Educ*, 39(2), 126-138. doi: 10.1007/s13187-023-02385-7
- Winarto, H., Habiburrahman, M., Dorothea, M., Wijaya, A., Nuryanto, K. H., Kusuma, F., Utami, T. W. & Anggraeni, T. D. (2022). Knowledge, attitudes, and practices among Indonesian urban communities regarding HPV infection, cervical cancer, and HPV vaccination. *PLoS One*, 17(5), e0266139. doi: 10.1371/journal.pone.0266139
- Zhao, M., Wu, Q., Hao, Y., Hu, J., Gao, Y., Zhou, S. & Han, L. (2021). Global, regional, and national burden of cervical cancer for 195 countries and territories, 2007-2017: findings from the Global Burden of Disease Study 2017. *BMC Womens Health*, 21(1), 419. doi: 10.1186/s12905-021-01571-3
- Zheng, L., Wu, J. & Zheng, M. (2021). Barriers to and Facilitators of Human Papillomavirus Vaccination Among People Aged 9 to 26 Years: A Systematic Review. *Sex Transm Dis*, 48(12), e255-e262. doi: 10.1097/OLQ.0000000000001407