Effect of Nursing Educational Intervention on Knowledge and Preventive Behaviors Regarding Human Papillomavirus and Cervical Cancer Among Premenopausal Women

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ABSTRACT

Background: Cervical cancer remains a significant global health challenge, particularly in low- and middle-income countries. Human papillomavirus (HPV) infection is the primary cause of cervical cancer, which is largely preventable through vaccination and screening. However, knowledge gaps and inadequate preventive behaviors persist among women in many regions.

Purpose: This study aimed to evaluate the effect of a nursing educational intervention on knowledge and preventive behaviors regarding HPV and cervical cancer among premenopausal women.

Methods: A quasi-experimental design with pre- and post-tests was employed. A convenience sample of 120 premenopausal women aged 40-50 years was recruited from the Gynecological Outpatient Clinic at a university hospital in Egypt. Data were collected using, firstly, structured questionnaires that included demographic characteristics. Secondly, assessing knowledge about HPV, cervical cancer, and thirdly, preventive health

behaviors. The educational intervention was delivered through small-group sessions using lectures, discussions, and educational materials.

Results: The proportion of participants demonstrating satisfactory knowledge increased significantly from 38.3% pre-intervention to 71.7% post-intervention ($p < 0.001$). Statistically significant improvements were observed in knowledge about HPV immunization, cervical cancer definition, risk factors, diagnosis, treatment methods, and preventive health behaviors. Positive correlations were found between educational level and knowledge scores.

Conclusion: The nursing educational intervention effectively enhanced knowledge and preventive behaviors regarding HPV and cervical cancer among premenopausal women. These findings support the implementation of structured educational programs to improve cervical cancer prevention.

Implications for Nursing Practice

These findings highlight the critical role of maternity nurses in cervical cancer early detection and prevention through health education. Also, inform women about risks, signs, and encourage screening.

Keywords: Cervical cancer; educational intervention; human papillomavirus; knowledge; nursing education; preventive behaviors

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Introduction

Human papillomavirus (HPV) is a common sexually transmitted infection affecting populations globally and has been identified as the primary cause of cervical cancer, which ranks fourth in incidence and mortality among cancers in women worldwide. HPV is also associated with cancers of the anus, oropharynx (including the throat, tongue, and tonsils), penis, vagina, and vulva. Infection rates have been increasing in recent years, driven by changing sexual behaviors, limited public awareness, and unequal vaccine access in some regions (Obeid et al., 2020; Ampofo et al., 2022).

Cervical cancer accounts for approximately 604,000 new cases and 342,000 deaths annually, with peak incidence occurring between ages 40 and 49 years. Approximately 90% of these cases and deaths occur in low- and middle-income countries (Sung et al., 2021; Mwantake et al., 2022). In Egypt, cervical cancer is the second leading cause of cancer-related deaths among women, with an estimated 1,320 new cases recorded annually (Egypt Human Papillomavirus and Related Cancers, Fact Sheet, 2022). High-income nations have experienced more than 50% reduction in cervical cancer incidence and mortality through organized screening programs (El Rahman et al., 2021; Bruni et al., 2023).

Cervical cancer is highly preventable when early diagnostic screening occurs. However, barriers to care utilization among women include lack of education about the disease, religious and cultural beliefs, inadequate access to preventive services, financial limitations, and health system constraints (Habtu & Laelago, 2018; Khatap et al., 2025). The World Health Organization's 2024 report emphasizes that increasing public awareness and delivering knowledge and services across the life course are essential for prevention (WHO, 2024).

Background

Vaccination between the ages of 9 and 14 years is one of the most effective strategies to prevent HPV infection and HPV-related cancers. Screening for cervical diseases can begin at age 30 and, when detected early, is curable at any age. Participation in cervical screening is directly influenced by women's understanding of HPV and the perceived importance of vaccination (WHO, 2024). Health education is a key component of primary prevention but is often underutilized; reducing modifiable risk factors can lower cancer incidence (Aziz et al., 2022; Aulia & Hartanti, 2023).

Previous research has demonstrated the effectiveness of educational interventions in improving knowledge and practices related to cervical cancer prevention. Khatap et al. (2025) reported statistically significant improvements in knowledge and practice across study phases with sustained positive attitude changes post-intervention ($p < 0.001$). Given these considerations, this study aimed to evaluate the effect of a nursing educational intervention on knowledge and preventive behaviors regarding HPV and cervical cancer among premenopausal women.

Study Hypothesis

Premenopausal women who receive the nursing educational intervention regarding HPV and cervical cancer will exhibit improvement in their knowledge and preventive behaviors post-implementation compared to pre-intervention.

Methods

Study Design

This study employed a quasi-experimental design with pre- and post-tests to evaluate the effects of an educational intervention. Data were collected at the gynecological outpatient department of a university hospital in Egypt. The setting provides both free and paid services for women and operates daily from 9:00 a.m. until 2:00 p.m.

Sample and Setting

A convenience sample of 120 premenopausal women was recruited over six months. Inclusion criteria were: (a) women aged 40-50 years, (b) diagnosed with vaginitis or cervicitis, and (c) willing to participate. Sample size was calculated using the formula $n = N / [1 + N(e)^2]$, where N = 175 (annual flow rate) and e = 0.05 (margin of error), yielding a required sample of 120 participants.

Instruments

Three tools were developed based on relevant literature (Heena et al., 2019; Michelle et al., 2021; Henke et al., 2021):

Tool I: Structured Interview Questionnaire. This 21-item questionnaire assessed demographics (age at marriage, number of marriages, marital status, occupation, residence, and education) and medical, obstetrical, and contraceptive history.

Tool II: Knowledge Assessment Questionnaire about HPV and Cervical Cancer. This 30-item questionnaire assessed knowledge about female reproductive anatomy, HPV transmission and immunization, cervical cancer definition, risk factors, symptoms, diagnosis, stages, treatment, and complications. Correct responses received a score of 1, incorrect or unknown responses received 0. Satisfactory knowledge was defined as ≥60% of the total score.

Tool III: Preventive Health Behavior Assessment. This 15-item questionnaire assessed knowledge about preventive behaviors, including HPV vaccination, avoiding multiple sexual partners, genital hygiene, and lifestyle modifications. Scoring followed the same criteria as Tool II.

Content validity was established through expert review (CVI = 0.898). Cronbach's alpha coefficients demonstrated high reliability: 0.842 for the knowledge questionnaire and 0.866 for preventive behaviors.

Data Collection Procedures

Phase 1 (Assessment): Baseline data were collected through individual interviews. Each participant was briefed on the study purpose and provided verbal consent. Completing the instruments took approximately 30-35 minutes.

Phase 2 (Planning and Intervention): An educational brochure was developed based on participants' needs. The intervention was delivered in three small-group sessions (3-5 women per group) using interactive lectures, group discussions, brainstorming, and educational materials, including PowerPoint slides, posters, and illustrated booklets.

Phase 3 (Evaluation): Two weeks after the intervention, the same instruments were re-administered to evaluate effectiveness.

Data Analysis

Data were analyzed using SPSS version 28.0. Descriptive statistics (frequencies, percentages, means, and standard deviations) were calculated. Chi-square tests compared categorical variables between pre- and post-intervention. Spearman's rank correlation examined relationships between variables. Statistical significance was set at $p \leq 0.05$.

Ethical Considerations

This study received ethical approval from the university's Faculty of Nursing Research Ethics Committee (Approval No: ZU.NUR.REC:257). Verbal informed consent was obtained from all participants after explaining the study purpose. Participants were assured of confidentiality and their right to withdraw at any time without consequences.

Results

A total of 120 premenopausal women completed the study. The mean age at marriage was 20.22 ± 6.43 years, and 77.5% had been married once. Regarding medical history, 40% reported a history of sexually transmitted diseases (Trichomonas vaginalis: 64.6%; Chlamydia: 35.4%). Immune diseases were present in 20.8% of participants. Additionally, 65% reported exposure to smoking (active or passive). Obstetric findings showed that 43.6% had vaginal deliveries, and 24.2% were multiparous (>3 births). For family planning, 85.9% used contraceptive methods, with IUDs being the most common (49.5%). Complete demographic characteristics are presented in Table 1.

Regarding knowledge sources, the majority obtained information from healthcare providers (physicians and nurses). Common presenting complaints included dyspareunia (71%), vaginal bleeding (62%), vaginal discharge (55%), and itching (38%).

There was a highly statistically significant improvement ($p < 0.01$) between pre- and post-intervention knowledge concerning female reproductive anatomy, HPV definitions, causes, stages

of cervical cancer, treatment methods, and complications. Post-intervention gains were also significant for HPV knowledge, risk factors, symptoms, diagnosis, and required screening tests (Table 2).

A statistically significant improvement ($p < 0.001$) occurred in total knowledge scores about HPV and its vaccination, cervical cancer, and preventive health behaviors (Table 3). Overall, satisfactory knowledge increased from 38.3% pre-intervention to 71.7% post-intervention (Figure 3).

Correlation analysis revealed statistically significant positive correlations ($p < 0.05$) between total knowledge scores regarding cervical cancer, HPV immunization, and preventive health behaviors with educational level and residence. A negative correlation was noted between educational level and preventive behavior scores (Table 4).

Table 1 Demographic Characteristics, Medical, Obstetrical, and Family Planning History of the Studied Women (N = 120)

Characteristics	Category	n	%
Demographic Characteristics			
Age at marriage (years)	15-20	20	17.3
	21-30	100	82.7
	Mean ± SD: 20.22 ± 6.43		
Number of marriages	1 time	93	77.5
	2-3 times	27	22.5
Marital status	Married	95	79.2
	Widow/Divorced	25	20.8
Occupation	Working	86	71.6
	Not working/Housewife	34	28.4
Residence	Rural	71	59.1
	Urban	49	40.9
Education level	Illiterate	12	10.0
	Read and write	24	20.0
	Primary/Secondary	39	32.5
	University education	45	37.5
Medical History			
Having chronic diseases	Yes	77	64.1
	No	43	35.9
Type of chronic diseases*	Hypertension	32	26.6
	Diabetes Mellitus	25	20.8
	Heart Diseases	20	16.6
History of STDs	Yes	48	40.0
	No	72	60.0
Types of STDs (n = 48)	Chlamydia	17	35.4
	Trichomonas vaginalis	31	64.6
History of immune diseases	Yes	25	20.8
	No	95	79.2
Types of immune diseases (n = 25)	Mediterranean anemia	8	32.0
	SLE	7	28.0
	Rheumatoid Arthritis	10	40.0
Smoking (active or passive)	Yes	78	65.0
	No	42	35.0
Obstetrical and Family Planning History			
Parity	Nullipara	17	14.2
	Para 1	28	23.3
	Para 2-3	46	38.3
	Para > 3	29	24.2
Mode of delivery	Normal vaginal delivery	45	43.6
	Cesarean section	28	27.1
	Both NVD & CS	30	29.1
Age at first pregnancy	< 20 years	52	43.3
	> 20 years	68	56.7
Use of family planning	Yes	103	85.9
	No	17	14.1
Duration of FP use (n = 103)	< 5 years	18	17.4
	> 5 years	85	82.6
Types of FP methods used*	IUD	51	49.5
	Hormonal methods	30	29.3
	More than one method	22	21.2

*Note. STDs = sexually transmitted diseases; SLE = systemic lupus erythematosus; NVD = normal vaginal delivery; CS = cesarean section; FP = family planning; IUD = intrauterine device. *More than one answer possible.*

Table 2 Pre- and Post-Intervention Comparison of Knowledge About HPV and Cervical Cancer (N = 120)

Knowledge Items	Response	Pre n	Pre %	Post n	Post %	p-value
Anatomy of female	Correct	45	37.5	81	67.5	< **0.01****

Knowledge Items	Response	Pre n	Pre %	Post n	Post %	p-value
reproductive system						
	Incorrect	75	62.5	39	32.5	
HPV transmission and immunization	Correct	10	9.1	90	75.1	< **0.01****
	Incorrect	110	90.9	30	24.9	
Definition of cervical cancer	Correct	22	18.3	89	74.6	< **0.01****
	Incorrect	98	80.7	31	25.4	
Risk factors of cervical cancer	Correct	23	19.1	101	84.1	< **0.001****
	Incorrect	97	80.9	19	15.9	
Symptoms of cervical cancer	Correct	19	15.9	31	25.8	**< 0.05***
	Incorrect	101	84.1	89	74.2	
Causes of cervical lesions	Correct	13	10.8	38	31.6	< **0.01****
	Incorrect	107	89.2	82	69.4	
Diagnosis	Correct	5	4.1	95	79.1	< **0.01****
	Incorrect	115	95.9	25	20.9	
Stages of cervical cancer	Correct	9	7.5	80	67.5	< **0.01****
	Incorrect	111	92.5	40	33.5	
Screening practices (Pap smear)	Correct	9	7.5	80	67.5	< **0.01****
	Incorrect	111	92.5	40	33.5	
Cervical cancer complications	Correct	13	10.8	59	49.1	< **0.01****
	Incorrect	107	89.2	61	51.9	
Treatment methods	Correct	10	8.0	97	80.3	< **0.01****
	Incorrect	110	92.0	23	19.7	

*Note. HPV = human papillomavirus. *p < 0.05. **p < 0.01.*

Table 3 Pre- and Post-Intervention Comparison of Total Knowledge Scores (N = 120)

Knowledge Domain	Level	Pre n	Pre %	Post n	Post %	χ^2	p-value
HPV and its immunization	Satisfactory	21	17.5	89	74.1	34.07	< **0.001****
	Unsatisfactory	99	82.5	31	25.9		
Cervical cancer	Satisfactory	9	15.0	35	58.3	38.01	< **0.001****
	Unsatisfactory	51	85.0	25	41.7		
Preventive health behaviors	Satisfactory	25	16.1	47	78.3	39.01	< **0.001****
	Unsatisfactory	35	83.9	13	21.7		

*Note. HPV = human papillomavirus. Satisfactory = ≥ 60% score; Unsatisfactory = < 60% score. **p < 0.001.*

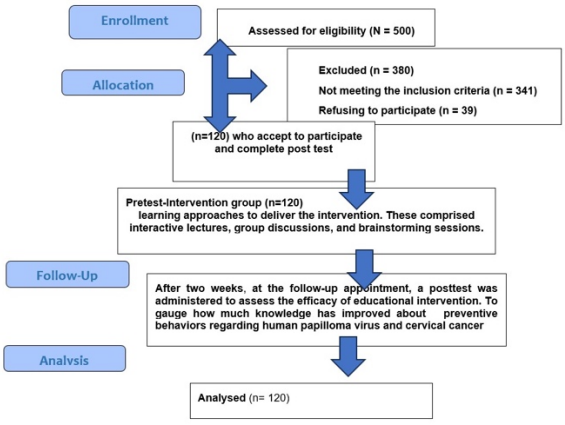
Table 4 Correlation Coefficients Between Total Knowledge Scores and Demographic Characteristics (N = 120)

Variables	Cervical Cancer	HPV and Immunization	Preventive Health Behavior
Age at marriage	.521	-.089	-.333
Educational level	**.553***	-.097	**-.293***
Marital status	-.135	.239	.239
Residence	**.299***	-.079	-.078

*Note. HPV = human papillomavirus. Spearman's rank correlation coefficients. *p < 0.05.*

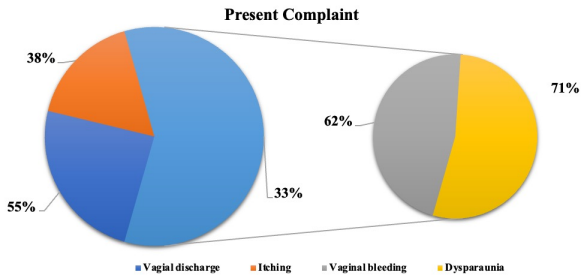
Figure 1 CONSORT Flow Diagram

Figure 1: Consort flow diagram



Description: Flow diagram showing participant enrollment, allocation, and analysis. Total enrolled: 120 premenopausal women from Gynecological Outpatient Clinic. No dropouts reported. All 120 participants completed pre-test and post-test assessments.

Figure 1 Women's Complaints at Presentation (N = 120)



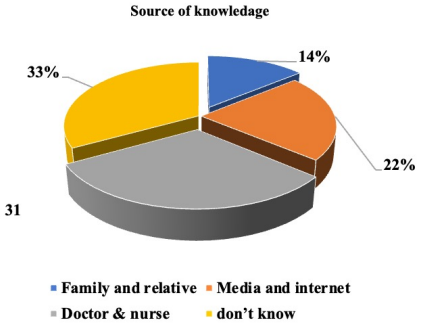
Data for Figure 1:

- Dyspareunia: 71%
- Vaginal bleeding: 62%
- Vaginal discharge: 55%
- Itching: 38%

Note. Percentages exceed 100% as participants could report multiple complaints.

Figure 2 Women's Sources of Knowledge About HPV and Cervical Cancer (N = 120)

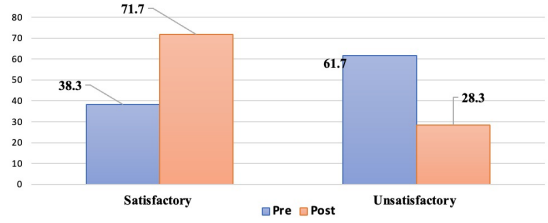
[Insert Bar Chart Here]



Data for Figure 2:

- Healthcare providers (doctors/nurses): Primary source (~33%)
- Family members
- Friends
- Media/Internet

Figure 3 Comparison of Satisfactory Knowledge Levels Pre- and Post-Intervention (N = 120)



Data for Figure 3:

Overall Satisfactory Knowledge:

- Pre-intervention: 38.3%
- Post-intervention: 71.7%

Note. Satisfactory knowledge is defined as ≥ 60% of the total score. The increase from 38.3% to 71.7% represents a statistically significant improvement ($p < 0.001$).

Discussion

This study demonstrated that a structured nursing educational intervention significantly improved knowledge and preventive behaviors regarding HPV and cervical cancer among premenopausal women. These findings are consistent with global evidence supporting educational interventions as effective strategies for cervical cancer prevention.

Regarding medical history, more than half of the participants reported chronic diseases, with hypertension and diabetes being the most common. Nearly half had a history of sexually transmitted diseases, with Trichomonas vaginalis being the most frequent. These findings are consistent with Abd El-Hamed (2023), who reported that most women were multiparous with first deliveries occurring between 20 and 30 years. Fawzy et al. (2023) similarly reported that 67% married at 18-30 years with multiple pregnancies.

The finding that one-third of participants obtained knowledge from healthcare providers contrasts with Osei et al. (2021), who found that friends and family were the primary information sources. This variation may reflect differences in healthcare system access and health education delivery. Aziz et al. (2022) reported that 55.3% of women obtained cervical cancer knowledge from family members.

The significant improvement in knowledge across all domains following the intervention is consistent with Fawzy et al. (2023), who reported significant differences in knowledge items after educational intervention implementation. Ahmed et al. (2022) similarly found that women's knowledge improved significantly after a health belief model-based educational program ($p < 0.001$). These results support our hypothesis that structured nursing education effectively enhances women's understanding of HPV and cervical cancer.

The improvement in total knowledge from 38.3% to 71.7% satisfactory knowledge post-intervention is consistent with Osman et al. (2023), who demonstrated positive impacts of educational interventions on HPV vaccination knowledge and acceptance. Almutairi et al. (2022) also found significant improvement from pre-test scores ($p <$

0.005). Amin et al. (2025) revealed bidirectional relationships between health literacy and cervical cancer knowledge, suggesting that improvements in one domain enhance the other.

The positive correlation between educational level and knowledge scores aligns with Riza et al. (2020), who reported that women's educational characteristics significantly affected knowledge scores about cervical cancer prevention. These findings highlight the importance of tailoring educational interventions to participants' literacy levels.

Limitations

This study has several limitations. First, the single-center design and convenience sampling may limit generalizability to other settings or populations. Second, reliance on self-reported data may introduce recall or social desirability bias. Third, the short follow-up period (two weeks) does not assess long-term knowledge retention or behavior change. Future studies should employ randomized controlled designs with longer follow-up periods across multiple sites.

Implications for Nursing Practice

These findings emphasize the critical role of nurses in cervical cancer prevention through health education. Nurses are well-positioned to inform women about risk factors, recognize early signs, and encourage regular screening. Comprehensive cervical cancer control includes primary prevention through HPV vaccination, secondary prevention through screening and treatment of precancerous lesions, and tertiary prevention through diagnosis and treatment of invasive disease. Educational interventions should be integrated into routine gynecological care.

Conclusion

This study demonstrated that a planned nursing educational intervention effectively enhanced knowledge and preventive behaviors regarding HPV and cervical cancer among premenopausal women. Positive associations were observed between knowledge and educational level, while educational interventions successfully addressed knowledge gaps. These findings highlight the critical need for structured educational programs to improve women's capacity for cervical cancer prevention.

Recommendations

Based on study findings, we recommend: (1) conducting multi-center randomized studies to evaluate HPV prevalence and educational intervention effectiveness; (2) strengthening educational efforts to improve premenopausal women's understanding of HPV and cervical cancer prevention; (3) prioritizing routine cervical cancer screening at obstetric and maternal-child health facilities; and (4) evaluating similar preventive strategies among adolescent females to inform early interventions.

Ethical Consideration

We confirm that this manuscript is original and has not been published previously, nor is it under consideration for publication elsewhere. All authors have read and approved the final manuscript and agree to its submission. The study was approved by the Faculty of Nursing Research Ethics Committee at Zagazig University (Approval No: ZU.NUR.REC:257). All authors declare no conflicts of interest.

Data Availability Statement

- The dataset generated during and analyzed during the current study is available from the corresponding author upon reasonable request.

Declaration of Use of AI in Academic Writing

- Nothing to declare

Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest.

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Author's Contribution

Abobaker R. contributed to the conceptualization and methodology of the study. Mohamed N. was responsible for the study design and data collection. Ahmed N. shared in methods and processing. Mohamed A. handled data analysis and interpretation. Mohamed B. contributed to the literature review and manuscript writing. Alshammari F contributed to the literature review and writing and also responsible for data collection and gave final approval of the version to be published.

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