Efficacy of precede model-based educational program on women's knowledge and practice regarding cervical cancer prevention

Wafaa Kamel Sadek Abd El Rahman
Nursing fellow (woman's Health and Midwifery Nursing), students Hospital Mansoura University

Nahed Mousa Saber
Assistant professor of maternal and Newborn, Faculty of Nursing, Beni-Suef University

Amany A. Ahmed
Assistant professor of obstetrics, Gynecological and reproductive health Nursing, Sohag & Matrouh University

Abstract---Cervical cancer affects about half a million women every year, and the disease claims nearly 300,000 lives worldwide. The disease is largely preventable. Cervical cancer is the second most common cancer in women worldwide and is a major public health problem in poor countries. Aim: To determine the effect of PRECEDE Model-based educational program on women's Knowledge and practice regarding cervical cancer prevention. Design: Quasi-experimental research design pre-post-test was used to achieve the aim of this study. Settings: The study was applied in the gynecological outpatient clinics at Beni-Suef University Hospitals. Sample: A purposive sample of 100 pregnant women was recruited from the selected settings. Tools: Four tools were used: (1) a Structured interviewing questionnaire, (2) Predisposing, Enabling, and Reinforcing Questionnaire (PRECEDE model questionnaire), (3) a pregnant women's reported practices questionnaire on cervical cancer, and (4) pregnant women's attitude questionnaire regarding cervical cancer prevention. Results: The current results revealed that the mean score of knowledge, enabling factors, and reinforcing factors have been increased with statistical significance immediately and after one month of the educational program. Pregnant women had adequate practices toward cervical cancer preventive measures post-intervention compared to the pre-educational program. Pregnant women had a positive attitude toward cervical cancer preventive measures post-educational program intervention compared to pre-

educational program intervention. There was a statistically significant relationship between knowledge, enabling, reinforcing factors scores, and practices scores of cervical cancer preventive measures throughout the educational program intervention phases. Conclusion: It was concluded that implementing an educational program based on PRECEDE model for pregnant women was effective in improving knowledge and practice regarding the prevention of cervical cancer. Recommendation: The PRECEDE Model-based educational program regarding cervical cancer prevention should be integrated into the antenatal care for pregnant women in the different study settings.

Keywords---Cervical cancer, Knowledge, and practice PRECEDE model, Pregnant women.

Introduction

Cervical cancer affects more than half a million women each year, resulting in more than 300,000 deaths worldwide. In most cases, the source of the disease is high-risk subtypes of the human papillomavirus (HPV). The disease is largely preventable. About 90% of cervical cancer cases occur in low- and middle-income countries where there are no structured HPV screening or immunization programs. Cervical cancer incidence and mortality have more than halved in high-income countries since earlier screening programs (Cohen et al., 2019).

In Egypt, 25.76 million women aged 15 years and older are at risk of developing cervical cancer. Current estimates indicate that approximately 514 women are diagnosed with cervical cancer each year and 299 die from the disease. It is the second most common cancer in women worldwide and is the leading cause of cancer death in some underdeveloped countries. Cervical cancer is the 14th most common cancer in Egypt among women and the 12th most common among women aged 15 to 50 years. A pap smear is a safe, inexpensive, and effective screening test for cervical cancer (Organization, 2015 & Said et al., 2018).

The pap smear has long been considered the most effective test for detecting cervical abnormalities at an early stage. The great effectiveness of this preventive examination has led to a significant reduction in the incidence of invasive cervical cancer in women. However, most women who die from cervical cancer have never had a Pap smear before or had long periods between screenings. Any plan to promote healthy behavior in any community requires a needs assessment (Babazadeh et al., 2019). As a result, it is important to investigate the direct risk factors for cervical cancer that are prevalent in different groups of women, as well as the cognitive, emotional, and environmental elements that may play a role in women's willingness to participate in screening programs. Therefore, the Health Belief Model (HBM) is considered one of the most representative because of its effectiveness in explaining changes and maintenance of healthy behavior (Musa et al., 2017).

The PRECEDE (Predisposing, Reinforcing, Enabling, Causes in Educational Diagnosis, and Evaluation) model developed by Green and Kreuter is one of

several educational models that focus on factors influencing health-related behaviors based on the relationship between a healthcare professional and patient and is particularly suitable for use in chronic conditions (Green & Kreuter, 2005).

The PRECEDE -proceed model is one of the models used to program behavior change. This model was first presented by Green et al. in 1970 and was called the previous model. The PRECEDE –proceed model has certain phases, just like other programming models. As researchers have gained more knowledge and experience in use, this model has undergone some modifications. In 2005, Green and Kreuter presented the latest modified version of the pre-work model, which contains four programming phases, one implementation phase, and three evaluation phases: social evaluation, epidemiological evaluation, behavioral and environmental evaluation, educational, and environmental evaluation. Evaluations, management and policy evaluations, program implementation, process evaluation, impact evaluation, and outcome evaluation. This model identifies factors that influence health outcomes and helps policymakers achieve program goals (Green & Kreuter, 2005). It can be used to develop and evaluate a health promotion plan. The PRECEDE component allows researchers to work backwards from the research objective to create a blueprint for the instructional design of an educational intervention. PRECEDE stands for predisposing, reinforcing, and enabling constructs in educational/environmental diagnosis and assessment (Naz et al., 2018)**.**

In the research conducted by Hosseini et al., (2014), they reported and confirmed the effectiveness of this model and obtained acceptable educational results. In addition, the PRECEDE model has been recognized as an effective method for creating and providing the phases needed to improve health.

By increasing women's screening practices, maternity hospitals can reduce the incidence and mortality of cervical cancer. Nurses should be aware of the knowledge, behavior, and health of women in the region when planning their initiatives so that they can participate more actively in cervical cancer screening and benefit from the services provided. At the same time, these data can help in developing nursing programs aimed at helping and encouraging women to take the first step to improve their participation in cervical cancer screening (Akinyemiju et al., 2015; Bal & Şahiner, 2020; Naz et al., 2018)**.**

Women's education currently focuses on programs aimed at increasing women's participation in cervical cancer screening education. Culturally sensitive educational programs are more successful at increasing knowledge and correcting misinformation, according to research on learning effectiveness. Accurate health information and communication from health professionals are critical to gaining real knowledge and changing health misconceptions (Damiani et al., 2015).

Significance of the study

Egypt has a population of 30.55 million, and women aged 19 and older are at risk of cervical cancer. According to recent estimates, 866 women are diagnosed with cervical cancer each year, resulting in 373 women dying. Cervical cancer is the

tenth most common malignancy in Egyptian women aged 19 to 44 years. Early identification is key to reducing cervical cancer mortality (El-Zanaty, 2015). Health education strategies provide information about cervical cancer prevention and may be the key to changing knowledge, beliefs, and preventive actions about cervical cancer.

Operational definitions

Precede
It refers to predisposing, reinforcing, and enabling constructs in educational diagnosis and assessment.

Predisposing factors
These included certain characteristics or socioeconomic situations that put a person at risk of developing a disease or disorder. Educational intervention can influence some predisposing factors which include: knowledge, attitude, self-efficacy, and self-care.

Enabling factors
They mean availability and availability of resources and skills.

Reinforcing factors
These included relationships with influential people (family, friends, peers, health professionals, media, teachers, community leaders, politicians, etc.) that influence the adoption of healthy behaviors. The intervention can be aimed at the influencers successfully reaching the real target group.

The PRECEDE-PROCEED model
According to this model, there are two categories of enabling resources that influence the use of health services, including societal and personal enabling resources.

Aim of the study
The aim was to determine the effect of PRECEDE Model-based educational program on women's Knowledge and practice regarding cervical cancer prevention.

Research Hypothesis

Hypothesis (1): Pregnant women's knowledge regarding cervical cancer is expected to be enhanced after the intervention based on PRECEDE model-based educational program than before.
Hypothesis (2): Pregnant women's practices toward cervical cancer prevention are expected to be improved after the intervention based on PRECEDE model-based educational program than before.

Research design

Quasi-experimental research design pre-post-test was used to achieve the aim of this study. which is located on the first floor of the hospital. They consist of two

rooms for sonar, antenatal examination, gynecological examination, lab, and nursing staff. Also, there was a waiting area for women and a lecture room that included an adequate number of seats, and data show where the researchers interviewed the recruited pregnant women to conduct this study. These outpatient clinics provide diagnostic and therapeutic services for pregnant women from Saturday to Monday, from 9 a.m. to 1 p.m.

Settings: The study was applied in the gynecological outpatient clinics at Beni-Suef University Hospitals.

Sample: A convenient sample of 100 pregnant women was recruited from the selected settings.

Data collection tools

Four tools were used to collect the data for the study as the following:
Tool I: Structured interviewing questionnaire: it was developed by researchers and consisted of two parts as follows:
Part (1): It included demographic data of the pregnant women such as age, educational level, occupation, and residence.
Part (2): It included the obstetrical history of pregnant women; it contained three questions about the gravida, parity, and gestational age.

Tool II: Predisposing, Enabling, and Reinforcing Questionnaire: (PRECEDE **Model questionnaire):** it was developed by researchers after reviewing the literature (Green & Kreuter, 2005) and based on the educational and ecological approach of PRECEDE model. It included the following Parts:
Part I: Predisposing factor which included pregnant women's knowledge regarding cervical cancer**:** it was developed by the researchers after an extensive review of the related literature to identify the level of pregnant women's knowledge regarding cervical cancer. It included six questions about the definition, causes and risk factors, manifestation, complications, treatment, prevention of cancer and vaccination for cancer disease, Pap test, HPV vaccine, and cervical cancer screening.

Scoring system

The scoring system was calculated as: (2) for the "correct" answer and (0) for the "incorrect" answer. The total score ranges from
0 – to 12, a higher score indicates good knowledge. It was categorized for each woman into "good, fair and poor knowledge" as follows: poor<50 %. Fair was from 50% to 75 %, and good>75 %.
Part II: Enabling factors assessment: It included 3 questions do you previously receive an educational program regarding cervical cancer, do you know available resources and facilities for cervical cancer prevention and management? Do you have easy access to healthcare facilities?

Scoring system

Scores were given in the following way: A response of "Yes" to each question was

given one score and a response of "No" to questions received no score.

Part III: Reinforcing factors assessment: It included two questions do you have emotional support from your family? Will you have support from your family and your health care provider in implementing cervical cancer preventive behavior?

Scoring system

Scores were given in the following way: A response of "Yes" to each question was given one score and a response of "No" to questions received no score.

Tool III: pregnant women's reported practices of cervical cancer preventive behavior (Rosenstock et al., 1988 and Becker, 1974).); (pre-post tool); it included ten questions to assess the pregnant women's practices such as Do you have rest during the day?, Do you practice exercise at least 30 minutes daily (walking)?, Do you follow precaution prevention of cancer and take vaccination for cancer disease, Pap test, HPV vaccine, cervical cancer screening

Scoring system

The scoring system was calculated as: (0) for "no", and (1) for "yes". The questionnaire was evaluated giving a score of 0 – 10. The total score of each woman was categorized into "adequate and inadequate practices" as follows: inadequate < 50% and adequate >50%.

Tool IV: pregnant women's attitude Scale regarding cervical cancer **prevention was** developed by the researchers (American Diabetes Association, 2020). It included 5 questions: Do you think that stress may cause cervical cancer? Do you think that diet may cause cervical cancer? Do you think that exercise may cause cervical cancer? Do you think obesity may cause cervical cancer? Do you think that regular medical follow-up is important?

Scoring system

It is divided into 3 scores (neutral =0, disagree =1, and agree= 2). A total score equals 10. Total attitude scores ≥ 5 are considered a positive attitude and a score less than 5 is considered a negative attitude.

Validity and reliability of the tools

The content validity was tested for clarity, comprehensiveness, and appropriateness, and reviewed by five experts in the obstetrics and gynecology nursing field. No modifications were done. The reliability of the tools was assessed through Cronbach's alpha test was α= 0. 881 for the first tool, α= 0. 87 for the second tool, α=0.89 for the third tool, and α=0.76 for the fourth tool.

Pilot study

A pilot study was carried out on 10% of the sample (10) pregnant women to observe the clarity and testing of the feasibility of the research process. No modifications were done. Pregnant women involved in the pilot study were included in the study.

Ethical considerations

Before starting the study, the researchers met with the medical and nursing

directors of the selected settings to clarify the purpose of the study and obtain their approval. Written consent to participate in the study was obtained from pregnant women after the purpose of the study was explained to them. The researchers informed the pregnant women that the study was voluntary, that they were allowed not to participate, and that they had the right to withdraw from the study at any time without giving a reason. Moreover, they were assured that their information would be kept confidential.

Field Work

The study was applied in the period from March 2020 and ending in October 2020. The researchers attended the previously mentioned setting two days per week; from 9 a.m. to 1 p.m. It included the application of PRECEDE Model-based educational program on women's Knowledge and practice regarding cervical cancer prevention. Enabling factors are defined as those that help the progress of the performance of the health action such as resources and supportive approaches that are important to conducting behavior. In this study, the enabling factors are knowledge regarding available health facilities and informational resources (Educational sessions and Booklet), and the reinforcing factors included support from family and health workers.
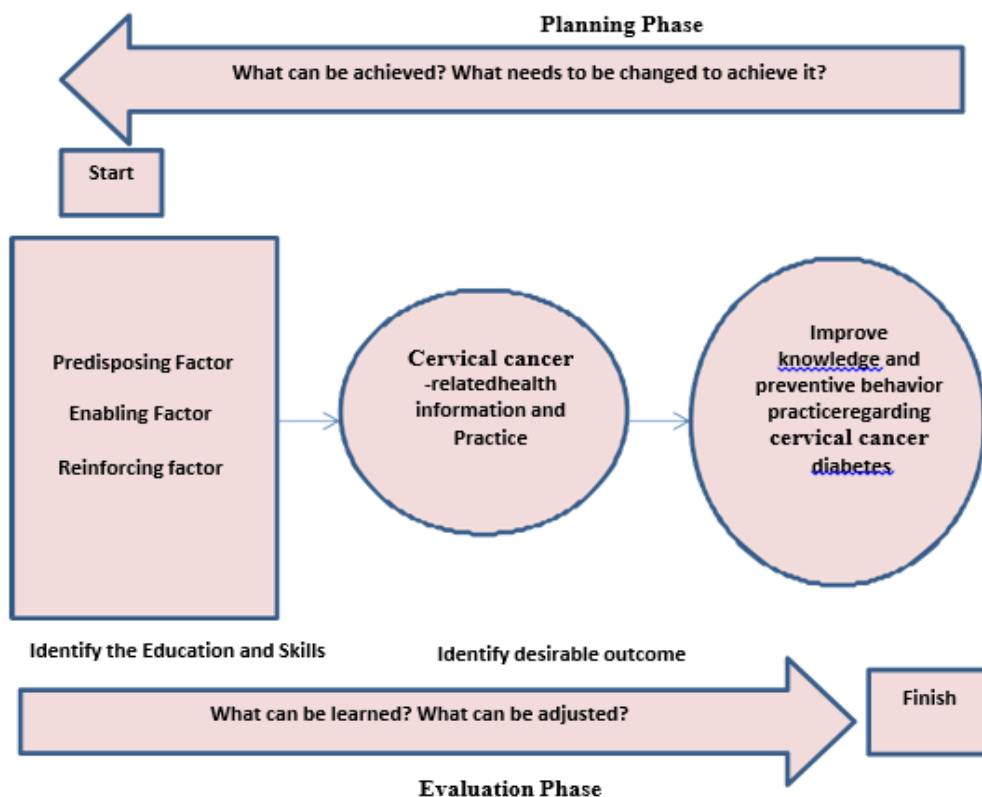
Figure 1: Application of PRECEDE model for improving knowledge and Practice of preventive behavior regarding cervical cancer

Application of PRECEDE Model-based educational program was done through the following phases:

A-Preparatory phase

Contents of the educational sessions based on PRECEDE model about cervical cancer were designed. Several methods of teaching were used (videos, attractive pictures, and a booklet) were prepared. The booklet was written in Arabic language, covered all contents of the sessions, was printed out regarding the sample size, and given to them.

B- Assessment phase

Data were collected by all investigators, and they presented themselves to the pregnant women. Scientists discussed clear and simple explanations of the purpose and nature of the study with pregnant women. A structured interview questionnaire was used to collect the characteristics of pregnant women.

During this phase, the predisposing factors, enabling factors, and enhancing factors of pregnant women were assessed based on predisposing, enabling, and enhancing questionnaires (the PRECEDE questionnaire model). Cervical cancer prevention behavior practices were assessed using pregnant women's self-reported cervical cancer prevention practices and cervical cancer attitudes using the Cervical Cancer Prevention Attitudes Questionnaire as a pretest. Questionnaires were distributed to pregnant women and collected after completion.

C-Implementation phase

For pregnant women, two PRECEDE-based educational courses on cervical cancer were held. In ten groups of ten pregnant women, he conducted three theoretical and two practical sessions in the form of lectures and group discussions for four weeks in the lecture hall of the gynecological outpatient clinics at Beni Suef University Hospitals. Each class is 45 to 60 minutes long. Definition, risk factors, symptoms, consequences, and treatment are covered in the first session, along with information on cervical cancer screening, the Pap test, the HPV vaccine, and cancer prevention. Education on reinforcing aspects, such as the value of support, as well as resources and support strategies that are essential to the behavior was also included in the discussion of enabling factors. While the second session focused on the discussion of cervical cancer prevention practices among pregnant women, it also included questions like: Do you sleep during the day? and Do you walk for at least 30 minutes each day? Or do you practice preventative measures such as getting a Pap test, an HPV vaccine, and cervical cancer screenings? Pregnant women received instructions on how to self-regulate their blood sugar, weigh themselves, and check the amount of sugar in their urine. Prepared videos and lovely photographs were displayed. After each session, significant issues were discussed. For each group of women, training sessions were repeated. After the first session, each expecting mother received a training manual as a reference and was notified of the time of the following session.

The Evaluation phase

The effect of the educational program based on precede model was evaluated immediately post of the implementation phase using the same tools II, III, and IV.

Administrative design

Approval was obtained from the Dean of the Faculty of Nursing and the directors of gynecological outpatient clinics at Beni- Suef University Hospital to carry out this study.

Statistical Analysis

Statistical Package for Social Sciences (SPSS) version 21 was used for statistical analysis of the obtained data. Data is presented using descriptive measures in the form of a number, percentage, mean and standard deviation. A Chi-square test was used for the differences between variables pre and post-intervention. Pearson correlation test was used to the association between variables. Cronbach's alpha was used to assess the reliability of the second, third and fourth tools.

Results

Table 1 shows that 80% of pregnant women between the ages of 18 and 30 had a mean age and standard deviation of 22.15 4.67 and that 36% of them had only completed their primary education. It also shows that 74% of pregnant women did not have a job. In addition, the same chart showed that 60% of pregnant women lived in rural areas and 40% came from cities**.**

Table 2 displayed the obstetric background of the pregnant women who were the subject of the study. It was noted that (60%) of the pregnant women were multigravida and (58%) were multipara. The mean gestational age of the pregnant women who participated in the study was 27.42 3.65.

The mean knowledge, enabling, and reinforcing factors score about cervical cancer declined before the execution of the educational program, according to Table 3. The mean knowledge score increased, but there was a statistically significant rise in the enabling and reinforcing aspects immediately following the educational program**.**

Figure (1) explains the overall attitude scores of the pregnant women who participated in the study for cervical cancer prevention before and after the intervention. It was noted that pre-intervention, 64% of pregnant women had a negative attitude toward cervical cancer prevention; this attitude dropped to 20% after the intervention. In contrast, 36% of the pregnant women pre-intervention had a positive attitude toward cervical cancer compared to 80% post-intervention. The overall practices score for cervical cancer among pregnant women before and after the intervention is shown in more detail in Figure (2). It was shown that the majority of pregnant women (87%) had subpar behaviors for preventing cervical cancer before the intervention, which declined to become (13%) post-intervention. In contrast, after the pre-educational intervention, 12% of pregnant women had adequate preventative practices, compared to 88% post-intervention**.**

Table (4): demonstrated that there was a statistically significant correlation between the knowledge, enabling factors, and reinforcing factors scores and the scores of the pregnant women's cervical cancer preventive behavior practices throughout the training program.

The correlation coefficient between the study group's overall knowledge, attitude, and practice score and their data is shown in Table (5). It showed that the pre-test knowledge score on cervical cancer was unrelated to educational attainment whereas the post-intervention score was related to age. There was no statistically significant correlation between the demographic factors and the attitude score as a whole. Regarding practices, it was noted that pre-test practice scores on cervical cancer were unrelated to educational attainment, however, post-intervention practice scores were related to age.

Table (1): Distribution of studied pregnant women according to their demographic characteristics (n=100)

Items	No.	%
Age in years		
18 < 30	84	84.0
30 ≤ 40	16	16.0
Mean ±Stander deviation	22.15 ± 4.67	
Educational level		
- Illiterate	14	14.0
-Primary education	36	36.0
-Secondary education	23	23.0
-University education	27	27.0
Occupation		
Working	26	26.0
Not working	74	74.0
Residence		
Urban	40	40.0
Rural	60	60.0

Table (2): Distribution of the studied pregnant women according to their obstetric history (n=100)

Items	No.	%
Gravida		
Primigravida	40	40.0
Multigravida	60	60.0
Parity		
Nullipara	24	24.0
Primipara	20	20.0
Multipara	58	58.0
Gestational age	27.42 ± 3.65	

Table (3): Comparison between the mean score of studied pregnant women related to their knowledge about cervical cancer, enabling factors, and reinforcing factors pre and immediate post of educational program (n=100)

Variable	Pre-educational intervention	Immediately post educational intervention	Paired t-test	P-value
	Mean ±SD	Mean ±SD		
Knowledge (Predisposing Factor)	.53±.43	1.94±.53	16.1	<0.001
Definition of cervical cancer	.63±.46	1.64±.46	17.2	<0.001
Risk factors of cervical cancer	.45±.64	1.39±.28	12.03	<0.001
manifestation of cervical cancer	.74±.52	1.78±.37	14.2	<0.001
Complications of cervical cancer	.74±.24	1.14±.36	63.2	<0.001
Management of cervical cancer	.55±.62	1.68±.35	12.2	<0.001
Prevention of cervical cancer	.35±.52	1.77±.24	11.1	<0.001
vaccination for cancer disease	.75±.24	1.14±.38	55.2	<0.001
Pap test	.55±.62	1.68±.35	13.2	<0.001
HPV vaccine	.35±.52	1.77±.24	14.1	<0.001
Enabling factors	.54±.43	1.42±.36	8.03	<0.009
Reinforcing factor	.75±.62	1.58±.27	23.2	<0.001

(*) statistically significant at p ≤0.05
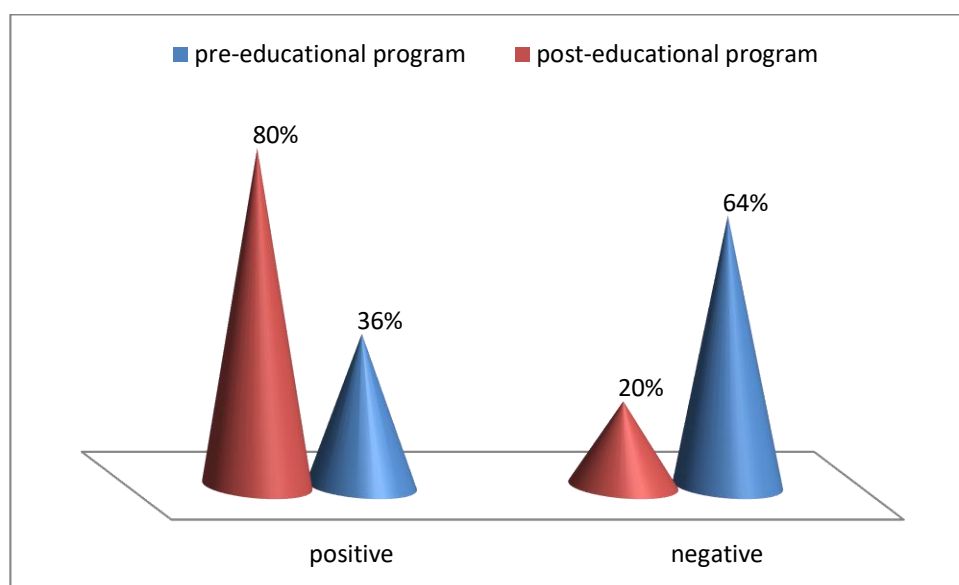(**) highly statistical significance at p < 0.001

Figure 1: Attitude of the studied pregnant women regarding the prevention of cervical cancer

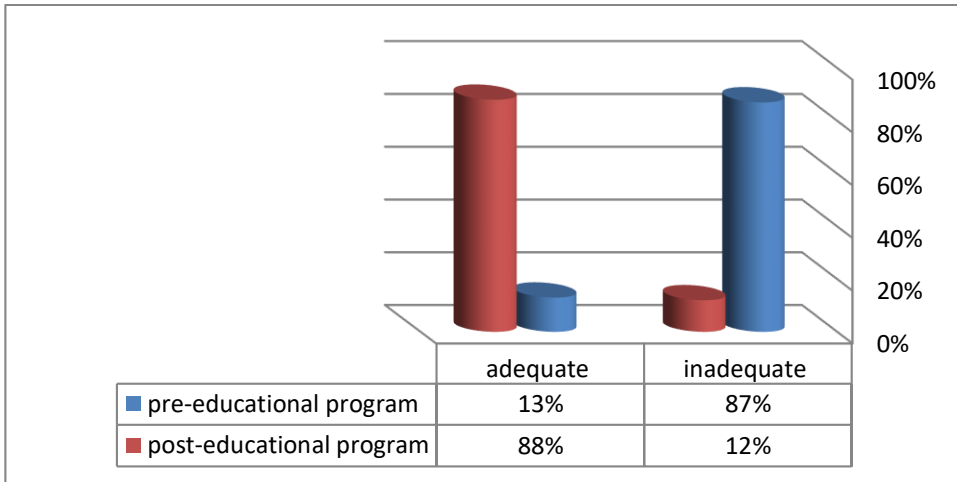|	adequate	inadequate
■ pre-educational program	13%	87%
■ post-educational program	88%	12%

Figure 2: Practices of the studied pregnant women regarding the prevention of cervical cancer

Table (4): Correlation between total knowledge, enabling factors, reinforcing factors, and preventive behavior practices scores of the studied pregnant women regarding cervical cancer pre and post of educational intervention implementation (n=100)

Knowledge	Practice			
	Pre		Post	
	r	P	R	P
Pre	0.43	0.46*		
Post			0.86	0.001*

Statistically significant at p<0.01

Table (5): Correlation coefficient between the total score of knowledge, attitude, and practices of the studied pregnant women and their data

Items		Total knowledge score		Total attitude score		Total practices score	
		Pre	Post	Pre	Post	Pre	Post
1-Age (years)	r_s	-0.021	0.330*	0.112	0.025	-0.022	0.332*
	P	0.852	0.002*	0.319	0.822	0.863	0.004*
2- Level of education	r_s	0.237*	-0.002	0.153	-0.063	0.238*	-0.003
	P	0.026*	0.974	0.178	0.581	0.028*	0.985
3- Number of children	r_s	0.007	-0.222	-0.184	-0.002	0.008	-0.203
	P	0.930	0.083	0.106	0.985	0.942	0.074

r_s: Spearman coefficient
*: Statistically significant at p ≤ 0.05

Discussion

Worldwide, women are affected by cervical cancer, a disease that is avoidable and has a well-known etiology. Detection of the disease early and education of the public about its risk factors. Health belief models and preventative methods are essential to reducing morbidity and death (Kieti, 2016).

According to the study's findings, the majority of pregnant women were between the ages of 18 and 30, with a mean age and standard deviation of 23.14 and 4.68 respectively. This age range reflects the fact that women were most likely to be in middle age groups and is the most common reproductive age range, according to the study. This explains why they cooperate, understand, and are more responsive to knowledge in addition to their schooling. Two-thirds of pregnant women, according to the study's findings, reside in rural areas. According to the researchers, this may be one of the reasons why knowledge and resource gaps exist in rural areas less than they do in metropolitan areas.

The findings of this study showed that before the adoption of an educational program, the mean score for knowledge, enabling factors, and reinforcing factors about cervical cancer declined. The lack of knowledge about cervical cancer has been recognized as one of the high-risk factors that lead to cervical cancer in poor nations, in the researchers' opinion, which may account for this. These results are consistent with those of a study by Neer et al. (2019), titled "Dosage Effect of Prenatal Home Visiting on Pregnancy Outcomes in At-Risk, First-Time Mothers," which found that implementing this model is an effective way to promote pregnancy outcomes, mother and fetus health, and both through raising mother awareness and making healthcare more accessible.

These findings are matched with results in a study conducted by Mahdi et al., 2016), about the "Effect of Precede-Proceed Model on Behaviors Prevention for Diabetes Mellitus among High-Risk pregnant women" and found that implementation of an educational program based on the preceding model significantly improved the knowledge among intervention group regarding behaviors Prevention DM.

The current finding coincides with a study conducted in Hamadan, Iran, where it was concluded that There is a significant and direct relationship between awareness level and performance, such that with higher awareness, the chance of doing a Pap smear test increases, as does the mean score of perceived sensitivity and severity after the intervention. Educational session classes about cervical cancer play an important role in changing women's knowledge and beliefs about cervical screening (Shobeiri et al., 2016).

According to the study's findings, there was a statistically significant rise in the mean score for knowledge, enabling factors, and reinforcing factors following an educational program. According to the experts, this showed the benefits of implementing the instructional program. Dehdari et al., (2019) study, titled Evaluation of an Educational Intervention Program Among Patients After Coronary Artery Bypass Graft Surgery Regarding the PRECEDE- PROCEED Model to

Improve Their Life Quality, found that the quality of life of those patients has improved following coronary bypass surgery.

According to the study's findings, pregnant women who were evaluated had a more positive overall attitude toward cervical cancer prevention after receiving treatment. This outcome is consistent with a study by Ranjbaran et al., (2015) entitled "Sleep Quality Improving by Using the PRECEDE Mode Among Patients After Coronary Artery Bypass Graft Surgery," which found that education based on the PRECEDE Model can enhance knowledge that is linked to a positive attitude toward the disease. From the perspective of the researchers, this may be connected to the beneficial impact of education on women's knowledge, abilities, and attitudes as education enhance the self-care of diabetic women and its management as the crucial role of health care professionals for additional training for women.

Cervical cancer overall practices score for pregnant women before and after the intervention was disclosed by the present study's findings. Pre-intervention practices for cervical cancer prevention were found to be insufficient in the majority of pregnant women, and these habits significantly improved after intervention, dropping to fewer than one-fifth. These results are consistent with those of Farbod et al. (2017), who investigated the impact of intervention using the PRECEDE model based on the quality of life in diabetic patients and demonstrated that the mean score of enabling and reinforcing factors significantly increased in the intervention group compared to the control group. These findings concur with those of Solhi et al. (2016), who found that implementing an intervention based on the PRECEDE model could boost enabling and reinforcing variables.

Furthermore, it is consistent with a study conducted in Khomeinishahr, Khomeinishahr, which concluded that the findings of this study indicate the viability of an educational program based on a model to improve the practice of women Pap smears (Hossaini et al., 2017). It also broadly concurs with review research conducted in Zarandieh, Iran, which suggests developing educational interventions to alter women's knowledge and views (Karimy et al., 2017). Further, the current results are somewhat consistent with a study completed in Korean, Asia, which revealed that women's lack of knowledge was one of the barriers to receiving a Pap screening test. As a result, cervical cancer education is required to increase Pap test screening, therefore cervical cancer education is needed to boost Pap test uptake and HPV vaccination in this disadvantaged group and underserved population (Lee & Lee, 2017).

The current finding demonstrated a statistically significant association between the pregnant women's knowledge, enabling factors, and reinforcing factors scores and their behavior practices scores for preventing cervical cancer. According to a study conducted in South Carolina, in the United States, perceived barriers were the largest determinants of screening behavior, which is in line with the current conclusion. This indicates that lowering the obstacles to Pap smear testing increases the rate of testing. It further noted that after the intervention, the experimental group's mean perceived self-efficacy score improved in comparison to the control group, indicating that having high self-efficacy increases one's

capacity, capability, competence, and self-confidence to successfully demonstrate behaviour (De Peralta et al., 2015).

Furthermore, it is consistent with a study conducted in Medelln, Colombia, where it was discovered that health education interventions aid in lowering psychological and personal barriers related to screening (Garcés-Palacio et al., 2018). Additionally, it supports a systematic review that demonstrated how many interventions and frameworks for changing health behavior serve as a solid foundation for cervical cancer screening. In accordance with the unique client circumstances, healthcare providers might select teaching strategies (Naz et al., 2018).

The current research revealed a strong positive link between the overall knowledge score of the examined women about cervical cancer screening and that score. Additionally, it may be inferred from this research that having good information might result in having a pleasant mindset, which then results in beneficial behaviors. This research is in line with a study carried out in Benha, Egypt, which found a statistically significant positive link between the total knowledge and overall health attitude scores before and after the model's implementation.

Last but not least, health education is a crucial component of nursing care, particularly when using complete models that address all parts of the issue and conditions that encourage change, like the PRECEDE model (Hanaa & Hend, 2014). Additionally, it is consistent with a study done in Benha, Egypt, which found a correlation between the pre-and post-intervention total scores of the studied women's knowledge, attitudes, and behaviors. This shows that an increase in knowledge is associated with an improvement in belief (Said et al., 2018).

Conclusion

Depending on the results of the current study, It was concluded that implementing an educational program based on PRECEDE model for pregnant women was effective in improving knowledge and practice regarding the prevention of cervical cancer.

Recommendations

In light of the study's findings, the researchers recommended that:
- The PRECEDE Model-based educational program regarding cervical cancer prevention should be integrated into the antenatal care for pregnant women in the different study settings.
- Replication of the current study with a larger sample of pregnant women in different settings is required for generalizing the results.

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