

Effect of Program Based on Health Belief Model on Women's Knowledge and Beliefs regarding Cervical Cancer Prevention

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Abstract

Background: Cervical cancer is the second most common cancer in women and the primary cause of mortality from cancer in developing countries. **Aim:** To investigate the effect of program based on Health Belief Model (HBM) on women's knowledge and beliefs regarding cervical cancer prevention. **Study Design:** A quasi-experimental design was utilized. **Sampling:** A convenient sample of 200 working women from Mansoura University's various faculties, 80 from theoretical faculties, 53 from practical faculties and 67 from medical faculties. **Tools:** For data collection, two tools were used. Tool one was a structured self-administered questionnaire that assessed socio-demographic variables and cervical cancer knowledge. The Champion Health Beliefs Model scale for cervical cancer was the second tool. **Results:** The results showed significant improvement post intervention for all items of the HBM scale for cervical cancer. **Conclusion:** Women who participated in the program based on a HBM exhibited greater knowledge and higher positive belief scores regarding cervical cancer prevention after the program compared to before. **Recommendation:** Raise women's awareness of cervical cancer prevention based on HBM.

Keywords: Cervical Cancer, Health Belief Model, Knowledge, Prevention.

Introduction

Cervical cancer is a major public health concern worldwide. According to the World Health Organization, one woman dies from cervical cancer every two minutes (WHO, 2020). Cervical cancer is still one of the most common cancers in women around the world. Between 2018 and 2030, the yearly number of new cases of cervical cancer is estimated to rise from 570,000 to 700,000, with annual mortality rising from 311,000 to 400,000. If identified early and treated properly, it is a preventable and curable illness (Finocchario-Kessler et al., 2016).

Cervical cancer in its early stage is usually asymptomatic. Therefore, regular utilization of cervical cancer screening is the first step to detect the deadly cancer in its early stage and prevent its spread

(Cohen, Jhingran, Oaknin & Denny, 2019). Inadequate health literacy, women's embarrassment with exposing their bodies to healthcare providers, and the health belief that cancer screening is not needed in the absence of symptoms are major barriers to cervical cancer screening utilization. In addition, recently (Wong et al., 2021) reported that limited access to healthcare and poor communication are other structural barriers that are associated with low screening utilization rates.

Cervical cancer is caused by a variety of viruses, the most prevalent of which being the human papillomavirus (HPV). Tobacco use, young age, early initiation of sexual activities, multiple sex partners, high parity, female under education, and long-term use of hormonal contraception are all well-known cofactors linked to cervical cancer. Other cofactors include chlamydia, human immunodeficiency virus, and herpes simplex virus type-2 infection, as well as certain dietary deficits. Furthermore, genetic and immunological host factors are expected to have

a role, but these have yet to be identified (**Bruni et al., 2019**).

HPV vaccination is currently recommended as a way for preventing cervical cancer before sexual debut. Despite the fact that it is suggested that the immunization be given before sexual activity, sexually active women might still receive it. The Advisory Committee on Immunization Practices in the United States of America (USA) advises that girls receive HPV vaccine when they are 11 or 12 years old, although it can be given at any age until they are 26 years old if they have not previously got it (**Petrosky et al., 2015**).

Furthermore, community-based education customized to a particular culture, literacy level, and prevalent attitudes is recommended to increase cervical screening and prevention involvement (**Savas et al., 2021**). In contrast to the limited efforts made in low- and middle-income nations, cervical cancer prevention and the impact of screening programs on cervical cancer-related deaths have gotten a lot of attention in developed countries (**Yimer et al., 2021**).

Nursing health education is a critical public health technique for inspiring people to protect themselves from diseases that may be avoided (**Koelen & Van, 2012**).

Health Belief Model (HBM) is a valuable assessment model for health developers who are planning intervention activities. Health behavior, according to the HBM, is the consequence of a set of basic beliefs regarding people's perceptions of perceived personal susceptibility, perceived disease severity, perceived advantages of new activity, and perceived barriers to implementing preventive health behavior (**Khademolhosseini, 2017**).

Champion Health Belief Model (CHBM) scales adapted to measure the health beliefs of Turkish women as regards cervical cancer and Pap Smear Tests (**Guvenc, Akyuz, & Açikel, 2011**). In the developing countries, the development of new screening procedures based on the proper use of cytological screening has proven encouraging (**Fatehi et al. 2016**). WHO has authorized visual inspection of the cervix with acetic acid (VIA) as a cervical cancer screening tool simpler and easier to perform by paramedical nurses and also is so economic (**Horo et al., 2015**).

In the present study, the researchers adapt HBM scales by adding VIA test instead of Pap smear test as it is the recent available screening test.

Significance of the study

According to recent predictions in Egypt, 33.2 million women were at risk of cervical cancer in 2020, with an annual incidence of 1320 cases. Cervical cancer is the 12th greatest cause of cancer death in Egyptian women aged 15 to 44, with an annual age-standardized mortality rate of 1.5 per 100,000 (**Bruni et al., 2021**).

In addition, 969 new cases were detected in Egypt in 2018, with 631 deaths, accounting for 2% and 1.6 percent of all malignancies and cancer-related deaths among women, respectively (**Arbyn et al., 2020**). According to **Bruni et al. (2015)**, cervical cancer screening coverage in developing nations was 19 percent on average, compared to 63 percent in developed countries, resulting in an increase in the death of affected women, particularly Egypt, for example, is a developing country.

Nursing health education provides correct information on cervical cancer prevention and plays a vital role in creating cervical cancer knowledge and beliefs, as well as a foundation for cervical cancer prevention behaviors. Furthermore, HBM is one of the most widely used models for guiding health behavior interventions. For forecasting future actions, the HBM focuses on a person's health-related behavior. Therefore, the present study was conducted as there is no previous study performed before at Mansoura University based on HBM for healthy women.

Operational Definition

In this study, the health belief model is defined as a combination of knowledge, beliefs, and actions taken by women, and used for assessment of a preventative health program as a preventive professional nursing practice.

Aim of the Study

The aim of the study was to investigate the effect of program based on the Health Belief Model (HBM) on women's knowledge and beliefs regarding cervical cancer prevention.

Hypotheses

To fulfill the aim of this study, two hypotheses were tested:

Hypothesis I: Women who participate in the cervical cancer preventive program based on HBM will exhibit greater knowledge scores after the program than before.

Hypothesis II: Women who participate in cervical cancer prevention program based on the HBM will exhibit positive belief scores after the program than before.

Subjects and Method

Research Design

A quasi-experimental design (one group pre-post-test) was used in this study. This type of design is an empirical study used to estimate the effect of a cervical cancer prevention program based on HBM women's knowledge and beliefs regarding cervical cancer prevention without random assignment. In this design, an outcome of interest (women's knowledge and beliefs regarding cervical cancer prevention) is measured prior to an intervention (preventive program based on HBM) (pretest), followed by the same measure of the same outcome after the intervention (posttest) (Pattison, Gutwill, Auster & Cannady, 2019).

Study Setting

This study was conducted at Mansoura University, Egypt in 8 out of 18 faculties (i.e., Faculty of Medicine, Pharmacy, Nursing, Science, Education, Art, Agriculture and Commerce).

Sampling

A convenient sample of 200 working women from Mansoura University's various faculties; 80 from theoretical faculties, 53 from practical faculties and 67 from medical faculties. Working women with cervical cancer or vaginal hemorrhage were excluded from the study sample.

Sample size

The sample size can be estimated using the following formula based on data from the literature (Ahmed et al., 2018), with a level of significance of 5% and a power of study of 80%:
$$n = \frac{2(Z_{\alpha/2} + Z_{\beta})^2 \times p(1-p)}{(d)^2}$$
 where, p = pooled proportion obtained from previous study; d = expected difference in proportion of events; $Z_{\alpha/2} = 1.96$ (for 5% level of significance) and $Z_{\beta} = 0.84$ (for 80% power of study). Therefore, $n = \frac{2(1.96 + 0.84)^2 \times 0.84(1-0.84)}{(0.1027)^2} = 199.8$. Accordingly, the sample size required is 200.

Allocation of the study Faculties'

All Mansoura University's faculties were written in enveloped seal and 8 faculties were randomly selected using a simple random sample technique. Each faculty had an equal chance of being involved in the study according to the findings of the choice of the enveloped seal.

Data Collection Tools:

Two tools for data collection utilized to conduct the present study.

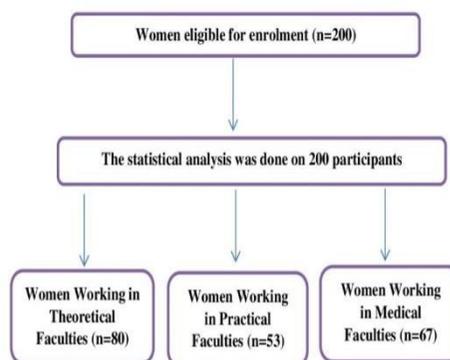


Figure (1): Flowchart of the participant's recruitment process

Tool I: A structured self-administered questionnaire was designed by the researchers after reviewing the relevant Arabic and English literature (Ahmed, Esa & El zayat, 2018; Johnson et al., 2019). It consists of two parts; **Part I:** Socio-demographic characteristics of the working women such as age, marital status and educational level, etc. **Part II:** knowledge of the working women about cervical cancer. It was classified into 6 categories; it composed of 26 questions; six questions to assess working women's knowledge regarding risk factors of cervical cancer, seven questions about manifestation & preventive measures, ten questions about management & screening tests and three questions about complications of cervical cancer. Each question had two levels of responses, score 2 was given for correct answer, score 1 was given to don't know or incorrect answer. Highest knowledge score was equal 52. The knowledge scores were divided into three categories: poor < 50 %; fair from 50 - < 65%; good ≥ 65 . The total knowledge scores for working women's regarding cervical cancer was classified as unsatisfactory knowledge when the total knowledge scores was less than 60% and satisfactory knowledge when

the total knowledge scores was more than or equal 60%.

Tool II: Champion Health for Beliefs Model Scale (CHBM) was developed by (Champion, 1999) and adapted to measure the health beliefs of Egyptian women as regards cervical cancer and modified by adding visual inspection with the acetic acid (VIA) Test as a screen cervical cancer test instead of Pap smear. It consisted from five subscales and included thirty-nine items. There are seven items for perceived susceptibility, ten for perceived severity, five for perceived benefits, ten for considered barrier, and seven for action cues. All subscale items include three-points Likert scale response options: three points for agree, two points for neutral, and one point for disagree. The total scores varied from thirty-nine to one hundred and seventeen points, including twenty-one points for perceived susceptibility, thirty points for perceived severity, fifteen points for perceived benefits, thirty points for perceived barrier, and twenty-one points for cues to action.

Validity and reliability of tools

Before beginning the current study, the content validity of the study tool were determined by reviewing the literature and then confirmed by five experts: two from the woman's health and midwifery nursing department, two from community health nursing, and one from obstetric medicine to see if the questionnaire items are relevant and can accurately measure working women's knowledge and beliefs about cervical cancer prevention. Minor changes were made based on expert advice to make several sentences easier to understand, and the final form was used for data collecting. The tools were translated into Arabic and then back-translated into English by bilingual Arabic experts.

The reliability test for part two of the first tool which concerned the working women's knowledge regarding cervical cancer was 0.82 and the reliability test for the second tool (HBM) was 0.81 by Cronbach's alpha. To test the applicability of the questionnaires, a pilot study was conducted on 20 working women (10% of the sample size), and these women were omitted from the study population.

Field work:

The present study was conducted from the beginning of December 2020 to the end June 2021. Four phases were performed to fulfill the

research aim, namely, the preparatory, interviewing and assessment, implementation, and evaluation phases.

Preparatory phase

A review of the literature was used to design health educational program sessions about cervical cancer prevention based on HBM. A colorful booklet in easy Arabic language was created in accordance with the content. Five experts were provided the generated content to test its validity, and they were asked to share their thoughts and ideas on the session's content. The text was changed in accordance with the recommendations of the experts. The booklet was covering the following items; introduction about cervical cancer, magnitude of cervical cancer in Egypt, and health belief model items including susceptibility, severity, benefits, barriers, and cues to action.

Interviewing and assessment phase

The researchers went to the previously mentioned faculties; the first researcher went to the theoretical faculties, the second researcher went to the practical faculties and the third researcher went to the medical faculties. The eligible working women were invited to participate in the study. A written consent was obtained after clarifying the aim of the study that will be achieved through five educational sessions in five weeks. The administrator authority at the selected faculties found a place for conducting the program session. The place is often a meeting room consisting of a big table with chairs surrounding in a calm well ventilated environment. Tools were distributed to the working women as a baseline assessment of their Socio-demographic characteristics and general knowledge regarding cervical cancer (Tool I). In addition, perceived susceptibility, severity, benefits, barrier, and cues to action to prevent cervical cancer based on HBM Pre- intervention (Pre-test). The researchers ensured that all information pertaining to the questionnaire sheet was completed by the working women. The questionnaires were distributed and collected in the same day. The researchers decide with their participants the appropriate appointment of the first educational session.

Implementation phase

The working women were divided into groups according to their distribution in each floor at their faculties, each group including from 10 to 15 working women. Due to the

COVID-19 outbreak, the researchers and the participated women followed the precautionary procedures recommended by WHO throughout all five program sessions (i.e., face masks and social distances). The five educational sessions lasted from 30 to 40 minutes. At the end of each session an appointment was determined by the researchers and their participants about the next session.

The first session objective was to provide an introductory session about cervical cancer and its magnitude in Egypt. Furthermore, women's knowledge regarding risk factors, symptoms, prevention, screening procedures, and treatment choices. The working women were given the supported colored booklet at the end of the first session.

The second session objective was to illustrate the items of the first subscale of HBM. Including information regarding susceptibility and possibility to get cervical cancer, the need of VIA test for cervical cancer even if there were no symptoms appeared, family history, physical health and worry role for getting cervical cancer.

The third session objective was to illustrate the items of the second subscale of HBM. Including information regarding the severity of the cervical cancer such as the severity of cervical cancer in leading to death or hysterectomy, cervical cancer necessitates the management with chemotherapy or radiotherapy, the whole life of affected woman with cervical cancer change, cervical cancer makes woman feel uneasy and when thinking about it makes palpitation, cervical cancer threatens the relationships with others, cervical cancer is a serious and a hopeless case, and physical cost of cervical cancer is very high.

The fourth session objective was to illustrate the items of third subscale of HBM including information about the barriers of cervical cancer such as, the cervical cancer screening is useless because cervical cancer is incurable, VIA test is unpleasant and is high cost, Human Papilloma virus vaccine is very high, unawareness of the VIA screening test screening , fear of the positive result of VIA test, unaware of the proper age of screening, negative issues about HPV vaccine, unaware of

the place of VIA test screening, and unaware of the proper number of screening.

The fifth session objective was to illustrate the items of fourth and fifth subscale of HBM including information about the benefits of cervical cancer prevention such as VIA screening can detect cervical abnormalities before they progress, cervical abnormalities can be detected early on and easily treatable, female should have VIA screening to determine whether or not she is healthy, VIA screening has the potential to save my life and HPV vaccination is an effective primary cervical cancer preventive strategy. In addition, the session include information about the cues to action for cervical cancer prevention such as consuming a well-balanced diet, obey medical orders because they are benefit my state of health, take steps to improve health regularly, look for new health-related information, have annual physical checkups for illnesses, exercise at least three times per week.

After the end of the fifth educational session, the supportive educational booklet was given to all participants. Teaching methods included in the educational preventive program were small group discussions, open discussion, and brain storming. After the session, an additional 30 minutes was offered for answering more questions.

Evaluation Phase

At the end of the fifth session, the same tool used for pre- intervention was used for the post- intervention to evaluate the working women general knowledge regarding cervical cancer (part II tool I), and evaluate the working women perceived susceptibility, severity, benefits, barrier, and cues to action to prevent cervical cancer based on HBM (Tool II).

Ethical Considerations

Ethical approval to conduct the study was duly attained from the Faculty of Nursing ethical committee of Mansoura University. Formal permission was obtained from the authority of Mansoura University's various faculties. After the aim of the study was clarified, every participant in the study gave their written consent. All participants were promised that the obtained data would be kept private, and that they had the opportunity to discontinue participation at any moment.

Statistical analysis

After encoding and input, the data is analyzed using the SPSS (Standards for Statistical Product and Service Solutions) version 25 software package. Continuous data were normally distributed and expressed as mean \pm standard deviation (SD). The frequency and percentage of categorical data were used. The comparisons were determined using dependent sample t test for two variables with continuous data. Chi-square test was used for comparison of variables with categorical data. Statistical significance was set at $p < 0.05$. In addition, A highly significant level value was considered when $p < 0.001$.

Results

Table 1 clarifies that the mean age of the participants was 34.04 ± 7.71 years, and 83.0% of them were married.

Regarding to education, 66.0% of the participants were university graduate, and 40.0% of them worked at theoretical faculties.

Table 2 shows highly statistically significant improvement in the participants' total knowledge scores regarding cervical cancer post intervention than before for all items ($P = 0.000$).

Figure 2 illustrates only 16.5% of the participants had good knowledge about

cervical cancer according to the pretest. Post intervention, majority (91.5%) of them had good knowledge. There was a highly statistically significant difference ($p = 0.001$).

Table 3 shows highly statistically significant differences between participants' mean scores for perceived susceptibility for cervical cancer pre and post intervention for all items.

Table 4 presents highly statistically significant differences between participants' mean scores for perceived severity of cervical cancer pre and post intervention for all items.

Table 5 indicates highly statistically significant differences between participants' mean scores of perceived barriers to cervical cancer prevention pre and post intervention for all items.

Table 6 demonstrates highly statistically significant differences between participants' mean scores for perceived benefits from cervical cancer prevention pre and post intervention for all items.

Table 7 presents highly statistically significant differences for participants' mean scores of perceived cues to action for cervical cancer prevention pre and post intervention for all items.

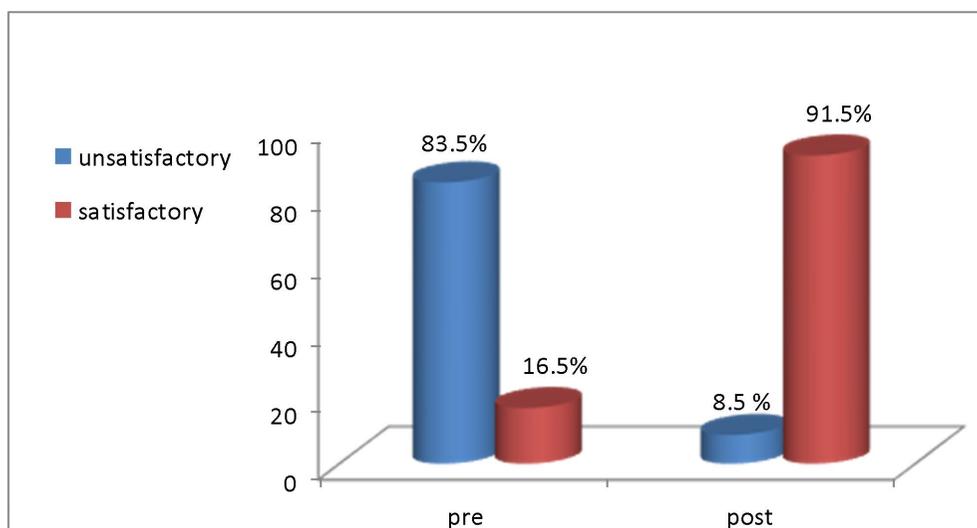
Table 1. Socio-demographic data of the working women

Socio-demographic data	No	N= 200	%
Age (years)			
20- <25	33		16.5
25-<30	50		25.0
30-<35	60		30.0
35-<40	20		10.0
≥ 40	37		18.5
Mean \pm SD	34.04\pm 7.71		
Marital status			
Single	16		8.0
Married	166		83.0
Widow	7		3.5
Divorce	11		5.5
Faculty type			
Theoretical	80		40.0
Medical	53		26.5
Practical	67		33.5
Education level			
Secondary	15		7.5
Intermediate	44		22.0
University graduate	132		66.0
Postgraduate degree	9		4.5

Table 2. Working women in relation to their pre- and post-intervention knowledge about cervical cancer

Knowledge items	N= 200												χ^2	P
	Pre-intervention						Post-intervention							
	Poor		Fair		Good		Poor		Fair		Good			
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
Risk factors	174	88.0	12	6.0	14	7.0	2	1.0	31	15.5	167	83.5	300.401	0.001**
Signs and symptoms	111	55.5	74	37.0	15	7.5	1	5.0	29	14.5	170	85.0	345.33	0.001**
Prevention	124	62.0	43	21.5	33	16.5	3	1.5	23	11.5	175	87.5	306.540	0.001**
Screening methods	156	78.0	30	15.5	14	7.0	1	5.0	19	9.5	180	90.0	297.536	0.001**
Treatment options	123	61.5	54	27.0	23	11.0	2	1.0	12	6.0	186	93.0	270.980	0.001**

**P<0.001 Highly statistically significant differences

**Figure 2.** Total level of knowledge regarding cervical cancer**Table 3.** Comparison of the mean scores of working women's health belief perceived susceptibility for cervical cancer prevention pre and post intervention

Health belief perceived susceptibility	N= (200)		t	p
	Pre-intervention (mean \pm SD)	Post-intervention (mean \pm SD)		
1. Cervical cancer is a possibility for me.	1.69 \pm 0.82	2.82 \pm 0.94	16.868	0.001**
2. I have a good possibility of having cervical cancer in the next few years.	1.13 \pm 0.33	2.80 \pm 0.43	43.185	0.001**
3. There is a high possibility that I will get cervical cancer	1.12 \pm 0.32	2.83 \pm 0.46	43.615	0.001**
4. I don't need a VIA test if I don't have any symptoms.	1.33 \pm 0.62	2.65 \pm 0.64	20.226	0.001**
5. Family history puts me at risk of getting cervical cancer	1.20 \pm 0.52	2.90 \pm 0.32	40.200	0.001**
6. My physical health makes me likely to have cervical cancer	1.16 \pm 0.36	2.99 \pm 0.39	66.412	0.001**
7. I worry a lot about cervical cancer	1.36 \pm 0.72	2.95 \pm 0.76	29.28	0.001**
Perceived susceptibility	8.98 \pm 1.44	19.93 \pm 1.84	83.89	0.000**

**P<0.001 Highly statistically significant differences

Table 4. Comparison of the mean scores of working women's health belief perceived severity for cervical cancer prevention pre and post intervention

Health belief (perceived severity)	N= (200)		t	p
	Pre-intervention (mean ±SD)	Post-intervention (mean ±SD)		
1. Cervical cancer may lead to death	1.70±0.64	2.78±0.76	19.94	0.000**
2. Cervical cancer may lead to a hysterectomy	1.79±0.92	2.75±0.96	12.35	0.000**
3. Cervical cancer is a serious health condition	1.81±0.87	2.68±0.98	12.602	0.000**
4. Cervical cancer can necessitate chemotherapy or radiotherapy treatment for a woman	1.33±0.62	2.65±0.64	20.226	0.000**
5. If I have cervical cancer, my whole life will change	1.52±0.77	2.70±0.55	15.341	0.000**
6. Cervical cancer makes me feel uneasy	1.58±0.71	2.75±0.61	17.291	0.000**
7. When I think of cervical cancer my heart beats faster	1.50±0.57	2.40±0.91	11.28	0.000**
8. I think cervical cancer threatens my relationship with others	1.54±0.63	2.54±0.84	10.55	0.000**
9. Cervical cancer is a hopeless disease	1.13±0.37	2.60±0.80	24.45	0.000**
10. Physical cost of cervical cancer is very high leading to an inability to afford treatment	1.82±0.98	2.83±0.38	24.45	0.000**
Perceived severity	16.49±2.54	26.71±3.65	39.44	0.000**

**P<0.001 Highly statistically significant differences

Table 5. Comparison of the mean scores of working women's health belief perceived barriers for cervical cancer prevention pre and post intervention

Health belief (perceived barriers)	N= (200)		t	p
	Pre-intervention (mean ±SD)	Post-intervention (mean ±SD)		
1. Cervical screening would simply make me more concerned	2.42±0.82	1.99±0.85	5.104	0.000**
2. Because there is no treatment for cancer, screening is not required	2.90±0.67	1.40±0.63	31.410	0.000**
3. VIA test are unpleasant	2.60±0.89	1.50±0.72	17.385	0.000**
4. The cost of an HPV vaccination or a VIA test is prohibitively high	2.80±0.66	1.37±0.48	30.665	0.000**
5. A VIA screening is too embarrassing	2.81±0.57	1.07±0.25	39.184	0.000**
6. Not having a VIA test is due to a fear of a positive result	2.75±0.43	1.21±0.40	39.927	0.000**
7. Unawareness of the places of a VIA test may affect my decision for screening	2.40±0.72	1.26±0.53	18.053	0.000**
8. Unawareness of the proper age for screening may affect my decision for screening	2.74±0.97	1.68±0.79	15.526	0.000**
9. Unaware that the number of screenings may affect my decision for screening	2.83±0.51	1.80±0.45	20.167	0.000**
10. I believe that obtaining the HPV vaccination series is risky or damaging to my health	2.78±0.41	1.07±0.25	49.0	0.000**
Perceived barriers	27.06±2.02	14.32±1.91	39.44	0.000**

**P<0.001 Highly statistically significant differences

Table 6. Comparison of the mean scores of working women's health belief perceived benefits for cervical cancer prevention pre and post intervention

Items	N= (200)		t	p
	Pre-intervention (mean ±SD)	Post-intervention (mean ±SD)		
1. I believe that a VIA test can detect cervical abnormalities before they progress to cancer	1.54±0.82	2.67±0.49	15.534	0.000*
2. I believe that if cervical abnormalities are detected early on, they are easily treatable	1.73±0.81	2.99±0.12	21.629	0.000*
3. I believe it is critical for a female to have a VIA test to determine whether or not she is healthy	1.77±0.62	2.79±0.58	16.819	0.000*
4. I believe that VIA screening has the potential to save my life	2.17±0.89	2.55±0.82	4.387	0.000*
5. I believe that an innovative HPV vaccination is an effective primary cervical cancer prevention strategy.	1.99±0.86	2.69±0.46	9.844	0.000*
Perceived benefits	9.19±2.53	13.66±3.32	19.013	0.000**

**P<0.001 Highly statistically significant differences

Table 7. Comparison of the mean scores of working women's health belief perceived cues to action for cervical cancer prevention pre and post intervention

Health belief (cues to action)	N= (200)		t	p
	Pre-intervention	Post-intervention		
	(mean ±SD)	(mean ±SD)		
1. I consume a well-balanced diet	1.97±0.41	2.51±0.64	9.954	0.000**
2. I always obey medical orders because I believe they will benefit my state of health	2.32±0.83	2.71±0.97	5.681	0.000**
3. I regularly take steps to improve my health	1.95±0.50	2.49±0.72	7.896	0.000**
4. When I don't eat well, I take vitamins	1.88±0.91	2.46±0.83	6.076	0.000**
5. I look for new health-related information.	1.81±0.64	2.77±0.76	17.828	0.000**
6. I have annual physical checkups for illnesses	1.98±0.93	2.75±0.43	5.722	0.000**
7. I exercise at least three times per week	1.96±0.60	2.56±0.49	10.053	0.000**
Perceived cues to action	13.86±2.10	18.0±2.86	15.586	0.000**

**P<0.001 Highly statistically significant differences

Discussion

The WHO (2019) reported that poor knowledge of risk factors, preventive measures, stigma, and myths about screening and treatment are still strong bottlenecks for the prevention and management of cervical cancer. There is a need for regional implementation guidance on the prevention and management of cervical cancer and a national comprehensive cervical cancer program should be put in place with linkages to relevant national plans by strengthening the focus on primary, secondary, and tertiary preventive strategies. The present study aimed to investigate the effect of program based on HBM on women's knowledge and beliefs regarding cervical cancer prevention.

The present study results revealed that there was significant improvement in women's knowledge about the risk factors, signs, and symptoms of cervical cancer after the cervical cancer preventive nursing program compared to before the program. This study's findings are consistent with a previous quasi-experimental study conducted by Utami and Purwani (2019) on 128 women in Indonesia in which they determined the effect of peer group health education on mothers' knowledge of cervical cancer risk. They concluded that the knowledge score increased in the experimental group after receiving health education.

In relation to women's knowledge about preventive measures of cervical cancer, the present study pointing out that there was improvement in the women's knowledge after the program compared to before the program. This study finding was congruent with a quasi-experimental study conducted by Devi and Dasila (2017) who studied 100 women in India to assess the effect of an education bundle on prevention and early detection of cervical cancer. They concluded that the health education program had a positive effect on women's knowledge of prevention and early detection of cervical cancer.

Concerning the screening methods of cervical cancer, the present study showed that there was improvement in the study group's knowledge about VIA test and vaginal endoscopy as screening methods after the program compared to before the program. This study finding was in agreement with an interventional study conducted by Gonul and Akyuz (2019) on 135 Turkish women to assess the effectiveness of interventions on increasing participation in cervical cancer screening. They noticed improvement in the total knowledge scores after training.

As regards women's knowledge about cervical cancer, the present study found that following the preventative program, women's overall level of knowledge about cervical cancer improved. This could be due to the use

of simplified language during instructional sessions. This study's findings are in line with those of **Said, Hassan, and Sarhan (2018)**, who conducted a quasi-experimental study on 65 Egyptian women. They claimed that following the session, their overall knowledge of cervical cancer had improved.

According to the HBM used in this study, in order to adopt cervical cancer preventive functions, an individual must believe that they are prone to a perceived sensitivity, perceptive severity of the disease's symptoms in various aspects of their lives, and find perceived benefits, such as a VIA test in reducing the risk or severity of the disease and perceived obstacles. In order to perform a risk-prevention function, the individual must also believe in the accomplishment of a VIA test (perceived self-efficacy) (**Nigussie, Admassu, & Nigussie, 2019**).

Concerning the construction of the perceived susceptibility, the present study findings showed that there was a positive belief score regarding perceived susceptibility after the nursing program compared to before the program. This study finding is consistent with that of a previous quasi-experimental study conducted by **Daryani et al. (2016)** on 120 Iranian women to evaluate effects of education based on a HBM on cervical cancer screening. They found a significant increase in the women's perceived susceptibility after intervention.

The perceived severity of a disease refers to the severity of a health problem as assessed by the individual (**Tavafian, 2012**). The present study showed significant differences before and after the program in relation to all items of perceived severity. This might be due to identification of the severity and the nursing educational intervention might have increased the awareness of the women.

The present study findings supported the study hypothesis that the nursing educational intervention based on a HBM will change health beliefs positively toward cervical cancer prevention. This study finding is consistent with a previous quasi-experimental study conducted by **Ahmed, et al. (2018)** in Helwan City on 150 Egyptian women to evaluate the effects of an educational program based on a HBM of women's knowledge and beliefs about

cervical cancer prevention. They found significantly increased perceived severity after intervention.

In relation to the perceived barriers of early detection and HPV vaccination among the studied women, the present study showed that, before educational intervention, the mean scores of perceived barriers regarding receiving a VIA test and HPV vaccination were high. This may be due to the lack of knowledge about VIA test and HPV vaccinations as well since study sample did not know where the test is done and had sense of shame regarding a VIA test or sexually transmitted diseases.

The present study finding was supported by **Reis et al. (2012)** who conducted a quasi-experimental study to explore Turkish women's knowledge, behaviors, and beliefs related to cervical cancer prevention and screening. They reported that, after implementing an educational intervention based on a HBM, the mean scores for the perceived barriers of receiving a VIA test and HPV vaccination were significantly decreased among the studied women.

The present study finding was in agreement with **Yossif and EL Sayed (2014)** conducted a quasi-experimental study in Benha City on 314 female university students to assess the effect of a self-learning package based on an HBM for cervical cancer prevention among female university students. They found that barriers to cervical cancer prevention practises were statistically significantly reduced after intervention compared to before intervention.

Thus, the present study findings indicated that the study hypotheses were confirmed.

Conclusions

The current study concluded that there was a highly statistically significant improvement in the women's knowledge and beliefs regarding cervical cancer prevention after the program than before. As a result, these findings backed up the study's main hypothesis: "Women who participate in cervical cancer prevention program based on the HBM has a positive effect on women's knowledge and beliefs regarding cervical cancer prevention".

Recommendations

- As part of the services provided to working women, cervical cancer health education should be incorporated.
- Health education initiatives based on HBM should be implemented in both rural and urban regions to raise cervical cancer awareness among all women.
- Future research should focus on understanding women's perspectives in order to remove any perceived barriers to screening and, hopefully, boost screening uptake.
- Launching a national cervical cancer screening effort to be available to all women in their settings, based on the new Egypt vision 2030 and health system.

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