- *Basic Research*

Tendency to Cervical Cancer Screening and Lifestyle Modification among Women: Utilization of Educational Program based on Theory of Planned Behavior

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Abstract

Background: Cervical cancer is one of the disastrous menaces to women's lives. Cervical cancer screening along with lifestyle modifications are pivotal for cervical cancer prevention and early detection. The theory of planned behavior is a widely used framework for predicting and understanding health behaviors. **Aim:** To evaluate the effect of educational program based on theory of planned behavior on cervical cancer screening and lifestyle modification among women. **Design:** A quasi-experimental research design (one group, ″pre –posttest″) was utilized to achieve the aim of the research. **Setting:** The study was conducted in Faculty of Nursing at Benha University in Qaliobya governorate, Egypt. **Sample:** A purposive sample of (52) women (administrative employees) was selected from the above-mentioned research settings. **Tools:** A structured self-administered questionnaire, Theory of Planned Behavior (TPB) constructs questionnaire and Health-Promoting Lifestyle Profile II (HPLPII). **Results**: There were highly statistically significant differences regarding to women' knowledge, theory of planned behavior constructs and lifestyle modification after educational program based on theory of planned behavior. There was a highly statistical significant positive correlation between total knowledge score and total scores of (attitude, lifestyle modification and TPB constructs) before and after implementation of program. **Conclusion:** The educational program based on theory of planned behavior was notably effective in enhancing knowledge, attitude, subjective norms, perceived behavioral control and behavioral intention toward cervical cancer screening among women. Moreover, the findings highlight the importance of TPB as a useful framework in promoting lifestyle modification regarding cervical cancer prevention. **Recommendations:** The theory of planned behavior could be beneficial integrated as an effective health promotion model for cervical cancer screening and prevention.

Keywords: Cervical cancer screening, Lifestyle modification, Theory of planned behavior

Introduction

Cervical cancer (CC) is the most prominent disease reflecting global inequities and the fourth common female malignancy worldwide. Various genetic and epigenetic alterations are implicated in its development ***(Riano et al., 2024)***. Cervical cancer commonly endangers the middle-aged and elderly females, and its incidence rate has been increasing annually over the past decade due to lifestyle changes and lack of regular cervical screening programs ***(Di and Wang, 2023).*** According to the HPV Centre, there are about 30.55 million women aged 15 and above in Egypt who are potentially susceptible to developing CC. The current data suggests that each year, CC is detected in approximately 969 women and 631 die ***(Elazab et al., 2021).***

One of the main causes of CC is the human papillomavirus (HPV) that turns dangerous for woman life. Oral contraceptives, high parity, smoking and alcoholism, co-infections, immunosuppression, specific dietary deficiencies, beginning sex at a young age and having multiple sexual partners are additional risk factors. Most cases may be asymptomatic at first, but later symptoms may include abnormal pain and vaginal bleeding, which is exacerbated by sexual intercourse ***(Gwavu et al., 2023).***

Of all malignant tumors, cervical cancer is the one that can best be prevented by screening. Ideally screening is a process undertaken before a woman actually experiences symptoms of cervical cancer; for many years, cervical cancer screening (CCS) has been based on cytological testing (Pap smear) for the early detection of cellular changes associated with precancerous cervical lesions. These cellular changes can be triggered by human papillomavirus (HPV). Newer, high certainty evidence has established the effectiveness of CCS strategies based on the detection of HPV ***(Nothacker et al., 2022).***

As an effective secondary prevention strategy, cervical cancer screening programs are extremely important for better prognosis and long-term survival ***(Koca and Açıkgöz, 2023).*** Early identification of CC has decreased mortality and morbidity. Effective screening programs may reduce the risk of CC. Attempts to prevent HPV infection, such as condom usage and sexual education, as well as the HPV vaccine and lifestyle modifications are the primary methods of preventing this type of neoplasm. Cervical cell screening and DNA-HPV testing in high-risk women are used as a secondary methods of preventing CC by identifying precancerous lesions or tumors in early stages ***(Basoya and Anjankar, 2022).***

The risk of cervical cancer begins to increase around age 30 years and remains elevated for the remainder of the lifespan. Therefore, CCS is recommended at least every 5 years for women aged 25 through 65 years ***(Perkins et al., 2023).*** Women living with HIV should be screened every 3 years starting at age 25. The global strategy encourages a minimum of two lifetime screens with a high-performance HPV test by age 35 and again by age 45 years. Precancers rarely cause symptoms, which is why regular CCS is important, even if woman has been vaccinated against HPV ***(World Health Organization, 2023).*** By 2030, it was proposed by WHO globally that, 90% of girls fully vaccinated with the HPV vaccine by age 15; 70% of women are screened with a high-performance test by 35 years of age and 45 years; and 90% of women identified with the CC receive treatment which could lead to a reduction of over 40% in new CC cases and prevent 5 million related deaths by 2050 ***(World Health Organization, 2022).*** Implementation strategies, have been found to improve recommended CCS, including invitation letters, reminder calls and educational materials ***(Bonuck et al., 2023).***

In developing countries, merely 5% of women uptake cervical screening compared to 40-50% in the developed countries ***(Omoyeni and Tsoka-Gwegweni, 2022).*** There are several barriers

to the current standard of care for cervical cancer screening. The structural barriers include lack of funds, limited qualified personnel and lack of infrastructure. Woman-level barriers include cultural beliefs, perceived fear of screening procedures and adverse outcomes, embarrassment, societal stigmatization, lack of spousal support, lack of knowledge, screening cost, privacy concerns, pain, misconceptions, low prioritization of CC and the poor health status of women ***(Asare et al., 2024).***

Cervical cancer can be prevented by adopting a healthy lifestyle. This includes practicing safe sex, maintaining good hygiene habits, eating a balanced diet rich in fruits and vegetables, exercising regularly, maintain a healthy weight, quitting smoking and stress management ***(Uniyal, 2022).*** It is estimated that around 40% of cancers could be prevented by adopting healthy lifestyles. In order to be successful at improving lifestyle habits, behavioral interventions should be accepted by women. Cancer screening programs have the advantage of reaching women repeatedly over the years and can be the ideal place to propose models capable of promoting healthy lifestyles, with the ultimate goal of inducing positive lifestyle modifications ***(Riggi,et al. 2022).***

Theory of planned behavior (TPB) is an important model of behavioral change (cognitive-social model of value expectation), which applicable to predict and understand behaviors and developed by **Ajzen and Fishbein** in 1980. It states that intention is the main determinant of behavior, affected by independent constructs, as follows: woman's attitude toward the behavior, subjective norms and perceived behavioral control ***(Jeihooni et al., 2023)***. TPB has been widely used to guide research in cancer screening–related behavior, screening methods that have acceptable validity and reliability include the Papanicolaou test and HPV test for cervical cancer ***(An and Vincent, 2022).***

Nurses play a key role in promoting CCS to achieve early cancer detection. The TPB, one of the most frequently applied behavioral theories, has been used to understand, predict, and change cancer screening–related behaviors ***(An and Vincent, 2022).*** Because of their central position in the health care delivery system, maternity nurses were instrumental in the cervical cancer screening. By providing women with timely and individualized information, can assist in raising awareness and positive outlook about the necessity of cervical cancer screening, encourage regular screening and boost CC discovery early, which will ultimately reduce the risk of cervical cancer-related illness and death ***(Abd El-hamed, 2023; Hamdar et al., 2023).*** Educating women about preventable risk factors are very important to reduce the risk of CC by using condom, having single sexual partner and avoid smoking, when high-risk behaviors are identified, nurses should assist women to identify and predict lifestyle changes to decrease the risk of CC ***(Tyerman et al, 2022).***

Significance of the research

Globally, gynecological cancers represent an ongoing source of concern, due to their still too high incidence and cancer-related mortality. Of all these cases, cervical cancer represents 6.5% ***(D'Augè et al., 2023).*** Cervical cancer ranks as the 13th leading cause of female cancer and the 12th leading cause of cancer deaths of female cancer deaths in Egypt. Among Egyptian females in the age bracket of 19 to 44, cervical cancer emerges as the tenth most frequently diagnosed cancer. Current estimations in 2020 indicate that about 1,320 new cervical cancer cases are diagnosed annually and about 744 cervical cancer deaths occur annually in Egypt ***(Yakout et al., 2022).*** Also, significant association between high parity (> 4) and CC was reported. A persistent infection with oncogenic HPV is recognized as the main cause of CC in Egypt ***(Ismail et al., 2023).***

The mortality from cervical cancer is 18 times more in low-resource countries. Till now; no national screening or HPV vaccination programs in Egypt. Although HPV-DNA test is the most accurate screening test; it is still expensive and not offered in our low-resource countries ***(Hemida et al., 2023).*** Cervical cancer screening is estimated to prevent 70% of cervical cancer deaths ***(Wilding et al., 2023).*** Implementing educational program regarding the cervical cancer screening is significant as it can help to bridge the knowledge gap, empower women to take charge of their health, help them to adopt preventive measures and seek timely medical care, which can ultimately reduce morbidity and mortality rates ***(Osman et al., 2023).*** It is advocated by the TPB-based health education mode that perceived behavioral control be performed and women' positive attitudes and subjective norms towards healthy lifestyles be improved in a scientific way, thereby enhancing the woman behavioral intentions and improving the quality of life ***(Di and Wang, 2023).***

Aim of the study:

The study was aimed to evaluate the effect of educational program based on theory of planned behavior on cervical cancer screening and lifestyle modification among women. This aim will be achieved through the following objectives:

1. Assess women's knowledge regarding cervical cancer screening.
2. Assess women's attitude, subjective norms, perceived behavioral control and behavioral intention regarding cervical cancer screening.
3. Assess women's lifestyle regarding cervical cancer prevention.
4. Design educational program based on theory of planned behavior.
5. Implement educational program based on theory of planned behavior.
6. Evaluate women's knowledge, attitude, subjective norms, perceived behavioral control and behavioral intention and lifestyle modification after application of theory of planned behavior.

Research hypotheses:

H1: The studied women will exhibit improved knowledge after implementation of educational program based on theory of planned behavior than before.

H2: The studied women will exhibit better tendency for cervical cancer screening that reflected through improved (attitude, subjective norms, perceived behavioral control and behavioral intention) after implementation of educational program based on theory of planned behavior than before.

H3: The studied women will exhibit more lifestyle modification after implementation of educational program based on theory of planned behavior than before.

Conceptual definitions:

Cervical cancer screening: refers to check the woman body for cervical cancer before symptoms develop. This can help to diagnose and treat cervical cancer at an early stage, and eventually contribute to reducing overall mortality. CCS now includes both the Pap and HPV screening tests

Lifestyle modification: refers the most important and effective strategy toward reducing the incidence of cervical cancer by adopting a healthy lifestyle and staying away from bad habits.

Operational definition:

Theory of planned behavior: refers to a behavioral theory that widely applied in clinical nursing recently. Behavioral intention is the main determinant of behavior, reflects the intensity of woman's willingness to perform a certain behavior. Behavioral attitudes, subjective norms and perceived behavioral control are variables that determine behavioral intention. behavioral

attitudes are woman's positive or negative assessment of behaviors, subjective norms are social pressures perceived by woman in specific behavior and perceived behavioral control is woman's previous experience and expected hindrance regarding cervical cancer screening.

Subjects and method

Research Design:

A quasi-experimental research design (one group, ″pre –posttest″) was utilized to achieve the aim of the research. The one-group pretest-posttest design is a type of quasi-experiment in which the outcome of interest is measured 2 times: once before and once after exposing a non-random group of participants to a certain intervention. An advantage of a pre-test and post-test study design is that there is a directionality of the research, meaning there is testing of a dependent variable before and after intervention with an independent variable ***(Choueiry, 2021).***

Study Setting:

The study was conducted in Faculty of Nursing at Benha University in Qaliobya governorate, Egypt. The Faculty of Nursing was established under the name of the Higher Institute of Nursing affiliated with the Faculty of Human Medicine - Zagazig University, Banha Branch. Then a presidential decision was issued to transfer the Higher Institute to the Faculty of Nursing, Zagazig University, Banha Branch. Study at the college began in the academic year 1993/1994 with 51 female students. The first bachelor's degree class graduated in 1997, and the number of graduates was 27 female students. Study and registration for the master's degree in nursing began in 1994 with 7 female students, and for the doctoral degree in nursing sciences in 1995 with 3 female students.

Sampling:

Sample size, type and criteria: A purposive sample of **(52)** women (administrative employees) were selected from the above-mentioned research setting**; according to following:** ***Inclusion criteria;*** **married women** aged 21–59 **years, able to communicate effectively, Volunteer and commit to completing the questionnaire.** ***Exclusion criteria;*** women diagnosed with cervical cancer, have previous cervical cancer screening and have history of hysterectomy or surgical treatment on the cervix. ***Technique:*** 52 women out of a total of 63 women because there were 5 women who were excluded for the pilot study and 4 women who did not meet the inclusion and exclusion criteria, and also there were two women who withdrew from the study.

Tools of data collection:

Three tools were used for data collection:

Tool I: A structured self-administered questionnaire: it was constructed by the researchers after reviewing a related literature and translated into Arabic language. It included two parts:

Part (1): **Personal characteristics of women:** it comprised 6 items which were (age, residence, level of education, occupation, monthly income and family history of cervical cancer).

Part (2): **Women's knowledge questionnaire:** It was designed by the researchers after reviewing a related literature ***(Komal et al., 2023; Tadesse et al., 2022; Mongsawaeng et al., 2016 and Sedrak et al., 2016)*** and translated into Arabic language. It was designed to assess women's knowledge regarding cervical cancer screening. All asked questions were in the form of MCQ questions. It consisted of (14 questions) such as (definition, risk factors, causes, signs & symptoms, complications, diagnosis, prevention methods of cervical cancer human papilloma virus vaccination, screening methods, pap smear screening, appropriate age for screening for married women, importance of screening, treatment methods and side effects of chemotherapy and radiotherapy).

Scoring system:
All knowledge items were weighted according to answers included in each question (multiple choice questions). Each item was given a score (1) when the answer was correct, a score (0) when the answer was incorrect or don't know. The total score was calculated by summation of the scores of all items. ***Total knowledge score was classified as the following:***

- **Good**: (> 60 % - 100% correct answers) = (9-14 score)
- **Fair**: (50≤60 % correct answer) = (7-8 score).
- **Poor**: (< 50 % correct answer) = (0-6 score).

Tool II: Theory of Planned Behavior (TPB) constructs questionnaire: it was adapted from ***(Xin et al., 2023)*** and contained questions on TPB constructs, including totally (38 Items) which divided as follow: attitude (22 Items), subjective norms (6 Items), perceived behavioral control (7 Items) and behavioral intention (3 item). Some modifications were made by adding several sentences to the attitude section to cover all their beliefs more comprehensively, and sometimes a simple change in some sentences to suit the morals and customs of our Eastern society.

Scoring system:
Each item was answered on a five-point scale (between 0 = strongly disagree and 4 = strongly agree). The scale scoring was carried out by summing up the items, and by reversing the values of negative attitude items. (i.e., if it is marked 4, it would be scored 0: if it is marked 3, it would be scored 1: a 2 remains unchanged). The score of the sections of attitude, subjective norms, perceived behavioral control and behavioral intention ranged from 0 to 88, 0 to 24, 0 to 28, and 0 to 12, respectively, with higher scores indicating higher levels of attitude, subjective norms, perceived behavioral control and behavioral intention. ***Total tendency score based on TPB model was classified as the following:***

- **High tendency**: (> 75 % - 100%) = (114-152 score)
- **Moderate tendency**: (50≤75 %) = (76-113 score).
- **Low tendency**: (< 50 %) = (0-75 score).

Tool III: Health-Promoting Lifestyle Profile II (HPLPII): It was excerpted from ***(Al-Kandari and Vidal, 2007)*** and ***(Walker and Hill-Polerecky, 1996)*** and used to evaluate the women's way of life or personal habits. The 52-items HPLPII was composed of a total scale and six subscales to measure behaviors in the theorized dimensions of health-promoting lifestyle: health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations and stress management.

- ***Health Responsibility*** encompasses an active sense of accountability for one's own well-being. It includes paying attention to one's own health, educating oneself about health and exercising informed consumerism when seeking professional.
- ***Physical Activity*** encompasses regular participation in light, moderate and/or vigorous activity. It may occur within a planned and monitored program for the sake of fitness and health or incidentally as a part of daily life or leisure activities.
- ***Nutrition*** encompasses knowledgeable selection and consumption of foods essential for sustenance, health and well-being. It includes choosing a healthful daily diet consistent with guidelines provided by the food guide.
- ***Spiritual Growth*** focuses on the development of inner resources and is achieved through transcending, connecting and developing. Transcending puts us in touch with our most balanced selves; it provides us with inner peace and opens us to possibilities of creating new options for becoming something more by going beyond who and what we are. Connecting is the feeling of harmony, wholeness and connection with the universe. Developing involves maximizing human potential for wellness through searching for meaning, finding a sense of purpose and working toward goals in.

- ***Interpersonal Relations*** entails utilizing communication to achieve a sense of intimacy and closeness within meaningful, rather than more casual, relationships with others. Communication involves the sharing of thoughts and feelings through verbal and nonverbal messages
- ***Stress Management*** entails the identification and mobilization of psychological and physical resources to effectively control or reduce.

Scoring System:
All items are scored as: Never (N) = 1, Sometimes (S) = 2, Often (O) = 3 and Routinely (R) = 4. Score for overall health-promoting lifestyle is obtained by calculating a mean of the women's responses to all 52 items; six subscale scores are obtained similarly by calculating a mean of the responses to subscale items. Total score was ranged from 52 to 208, the higher scores indicate a better engagement in each behavior. ***Total lifestyle modification score was classified as the following:***

- **Satisfactory**: (> 60 % - 100% of total score) = (146-208 score)
- **Unsatisfactory**: (≤60 % of total score) = (52-145 score).

Tools validity:
A panel of three jury experts in the field of obstetrics and gynecological nursing at Benha University evaluated the validity of questionnaires to ensure the clarity, relevance, comprehensiveness and applicability of tools. Minor modifications were required in formulating, adding or omission of some sentences. From the experts' perspective, the tools were considered valid.

Tools reliability:
The reliability of tools was done by Cronbach's Alpha coefficient test, which revealed that the internal consistency of research tools as following:

Tool	Cronbach's alpha value
Tool I "part 2": Women's knowledge questionnaire.	Internal consistency (α =0.79).
Tool II: Theory of Planned Behavior (TPB) constructs questionnaire.	Internal consistency of attitude, subjective norms, behavioral control, and behavioral intention was 0.84, 0.85, 0.84, and 0.90, respectively.
Tool III: Health-Promoting Lifestyle Profile II (HPLPII).	Internal consistency for the total scale was .94; alpha coefficients for the subscales ranged from 0.79 to 0.87

Ethical consideration:
Ethical aspects will be considered before starting the study as the following: The study approval obtained from scientific research ethical committee of the faculty of nursing at Benha University for fulfillment of the study. An official permission from the selected study settings was obtained for the fulfillment of the study. Before applying the tools, the researchers explained the aim and importance of the study to gain women's confidence. The researchers obtained signed consent from women to participate in the study and confidentialities was assured. The study didn't have any physical, social or psychological risks on the women. All tools of data collection were burned after statistically analysis to promote confidentiality of the participating women. The study tools were ensuring that didn't include any immoral statements and respect human rights. The women were free to withdraw from study at any time.

Pilot study:
The pilot study was conducted on 10% of the total sample size (5 women) to test the clarity, objectivity, feasibility and applicability of the tools and to find out the possible obstacles and problems that might face the researcher and interfere with data collection and to detect any problems peculiar to the statements as sequence of questions and clarity. It also helped to estimate the time needed for data collection. Modifications were done according to the pilot results and pilot sample was excluded from the study to avoid contamination of sample.

Field work:
A written formal approval was obtained from the dean of the faculty of nursing to obtain the consent to conduct the research after explaining its aim. The research was carried out from the beginning of March 2024 and completed at the end of August 2024 lasting for six months The researchers conducted the research two times weekly (Mondays and Wednesdays) from 10.00 a.m. to 2.00 p.m. at previously mentioned setting until the predetermined sample size was attained. The women were interviewed in small groups (4-5 women/day) by the researchers to implement the educational program based on theory of planned behavior. Each group of women was interviewed in their offices and according to their available times. At the end of this research the handout (booklet) about cervical cancer screening was provided to all women, so the benefit is spread.
The educational program based on theory of planned behavior was implemented through the following five phases; preparatory phase, interviewing and assessment phase, planning phase, implementation phase and evaluation phase.

Preparatory phase:
The preparatory phase is the first phase of the research; through which the researchers reviewed the local and international related literature about the research problem. This helped the researchers to be acquainted with magnitude and seriousness of the problem and guided the researchers to prepare the required data collection tools. The tools were distributed to three experts in the field of obstetrics & gynecological nursing at faculty of Benha University; the aim was to test its appropriateness, comprehensiveness, clarity, importance and applicability. The jury results were done.

Interviewing and assessment phase:
The researchers interviewed the women in their administrative offices. At the beginning of the interview the researchers welcomed the woman, introduced themselves to each woman included in the research, stated the purpose of the research, provided the woman with all information about scheduled sessions, its number and frequency to assure their adherence to interventions and took signed consent to participate in the research. At the initial visit, the researchers distributed ***(Tool: I) A structured self-administered questionnaire*** to assess personal characteristics of studied women and their knowledge regarding cervical cancer screening. Then, the researchers provided ***(Tool: II) Theory of Planned Behavior (TPB) constructs questionnaire*** to assess women's attitude, subjective norms, perceived behavioral control and behavioral intention regarding cervical cancer screening. Finally, the studied women were given (***Tool: III) Health-Promoting Lifestyle Profile II*** to assess women's way of life or personal habits using dimensions of health-promoting lifestyle: health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations and stress management.

The average time required for completion of the questionnaires was around (40 - 50 minutes). The data gathered during this phase served as the baseline for subsequent comparisons to assess the impact of the educational program based on theory of planned behavior. In this phase,

researchers start to determine the educational needs for each woman which help in the planning phase. Women's phone numbers were taken to create a WhatsApp group to facilitate communication after and between sessions.

Planning phase:

Based on results obtained during assessment phase, the educational program based on theory of planned behavior was developed by the researchers in a form of printed booklet illustrated with colored pictures. Booklet was constructed by the researchers after passing through an extensive and relevant literature review in the form of booklet using simple Arabic language and different illustrated pictures to facilitate understanding of its contents, satisfy the studied women's deficit knowledge, improve their behaviors regarding cervical cancer screening and modify their lifestyle. Sessions number and its contents, different methods of teaching, and instructional media are determined. Objectives were constructed to be attained after completion of educational program based on theory of planned behavior. The general objective was: by the end of educational program based on theory of planned behavior each woman will be able to acquire essential knowledge, improve women's behavior and modify their lifestyle.

Implementation phase

The researcher designed the educational program based on theory of planned behavior to evaluate knowledge, behaviors and lifestyle modifications regarding cervical cancer screening. This intervention was implemented through four scheduled sessions which were carried out over two consecutive weeks for each group "twice per week". It was conducted in the educational classroom in the third floor at Faculty of Nursing at Benha University; immediately after completion of the assessment phase. Each session took about 30-40 minutes according to their achievement and feedback. At the beginning of the first session women were oriented with the intervention contents. The subsequent session started by a feedback about the previous session and the objectives of the new session, simple Arabic language was used to suit women's level of understanding. At the end of each session, five minutes were devoted to permit women to ask questions to clarify the session contents and to correct any misunderstanding. Each woman informed about the time of the next sessions.

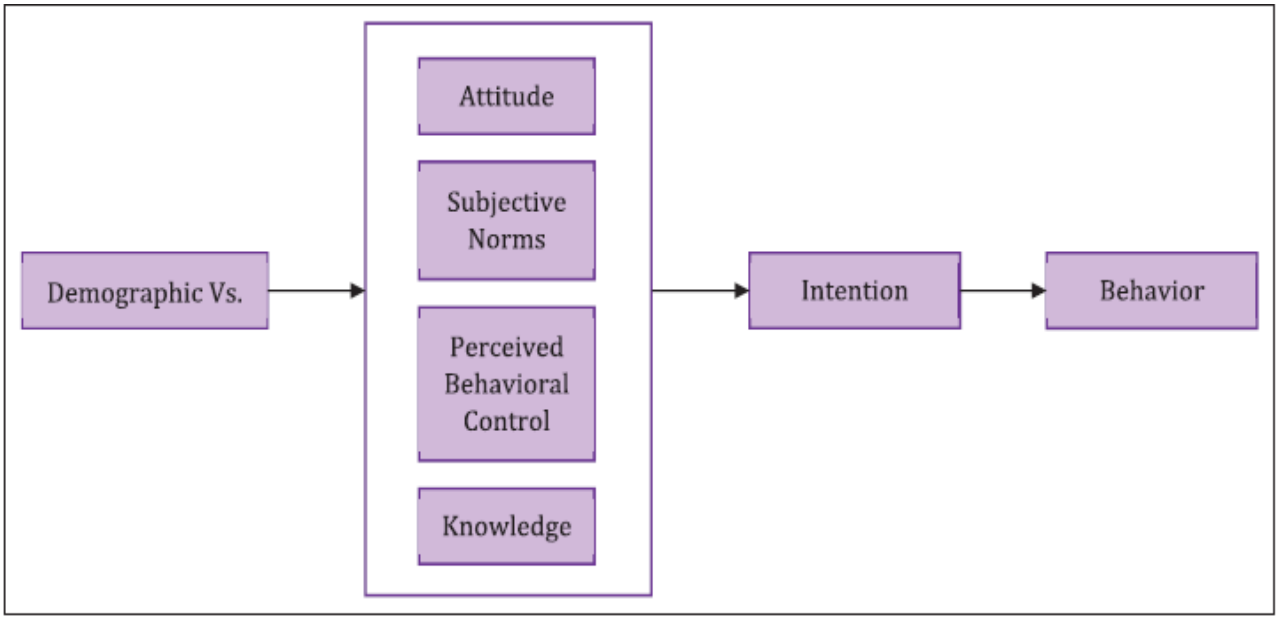

Figure (1): The conceptual framework of theory of planned behavior (TPB).

Different methods of teaching were used such as lectures, group discussions, critical thinking, problem solving and brainstorming. Instructional media include helpful tools such as laptop and PowerPoint slideshows, online and offline video; as well as the booklet was distributed to all recruited women in the study from the first session to achieve its objectives. Moreover, the researchers used supportive tools that function as stimulus control to support desired changes include stickers and flyers that reinforce the concepts of the intervention and emphasizing the effects of educational program based on theory of planned behavior on studied women.

Table (1): Educational program implemented for studied women.

Sessions	Objectives	Summary of topics and activities
First	○ Improving knowledge.	Providing information about definition, risk factors, causes, signs & symptoms, complications, diagnosis, prevention methods of cervical cancer, human papilloma virus vaccination, treatment methods and side effects of chemotherapy and radiotherapy. Increasing the participants' awareness screening methods, Pap smear screening, appropriate age for screening for married women, importance of screening and early detection.
Second	○ Changing and improving attitude.	Topics, including whether cervical cancer screening pleasant and useful or unpleasant and harmful, and its positive effects on women's health were discussed. Topics, including the positive effects of cervical cancer screening on women's health and longevity were discussed.
Third	○ Subjective norms (positive effect of family and doctor on cervical cancer screening).	In this session, the women were educated about the pivotal role of their relatives to support them for cervical cancer screening by a reproductive health specialist for women's health, and also some explanations were provided about encouraging and supporting their mothers or sisters or relatives regarding cervical cancer screening.
Fourth	○ Familiarity of women with perceived barriers to cervical cancer screening. ○ Promoting women's lifestyle habits.	Promoting perceived benefits of cervical cancer screening, cervical cancer screening barriers, and the ways to overcome them were presented. Promoting lifestyle modifications in all dimensions (health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations and stress management).

Evaluation phase:
The effectiveness of educational program based on theory of planned behavior was evaluated four weeks after implementation from the last session; using the same format of tools (Tool I "part 2", Tool II, and Tool III) which used during the assessment phase.

Statistical analysis:
Data were verified prior to computerized entry. The data collected will be organized, coded, computerized and analyzed by using appropriate statistical methods and tests. The Statistical Package for Social Sciences (SPSS version 22.0) was used. Descriptive statistics included frequencies and percentages, means, and standard deviations. Inferential statistics as the (Chi-square test and paired t test) was used to test the study hypothesis. The correlation coefficient

was used to investigate the relationship between scores of different variables. For all of the statistical tests done, p-value > 0.05 indicated no statistically significant difference, p-value ≤0.05 indicated a statistically significant difference, and p-value P ≤ 0.001 indicated a highly statistically significant difference.

Results

Table (1) shows that (40.4%) of studied women were in age group of 30 – 39 years old with the mean age of 40.83±8.79 years. Concerning residence, (59.6%) of studied women lived in countryside. Pertaining to the level of education, it was illustrated that (53.9%) of studied women had secondary or technical education. As far as, (86.5%), (61.5%) were employee and had insufficient monthly income, respectively. In addition, (96.2%) of studied women hadn't family history of cervical cancer.

Table (2) reveals that, there was a highly statistically significant differences in relation to all items of studied women's knowledge regarding cervical cancer screening before and after implementation of educational program (P ≤ 0.001).

Figure (1) displays that, at pre-implementation of program, only (19.2%) of studied women had good knowledge regarding cervical cancer screening. However, 4 weeks post-implementation of program, (75.0%) of studied women had good knowledge regarding cervical cancer screening.

Table (3) demonstrates that, there was a highly statistically significant improvement in relation to all constructs of theory of planned behavior domains related to behavior attitude, subjective norms, perceived behavioral control and behavioral intention after implementation of program more than before (P ≤ 0.001).

Table (4) elaborates that, there was a highly statistically significant differences regarding total mean scores of behavior attitude, subjective norms, perceived behavioral control and behavioral intention before implementation of program compared to the scores after implementation of program (P ≤ 0.001).

Figure (2) clarifies that, at pre-implementation of program, only (19.2%) of studied women had high tendency regarding cervical cancer screening. However, 4 weeks post-implementation of program, (51.9%) of studied women had had high tendency regarding cervical cancer screening.

Table (5) elaborates that, post-implementation of program; the total mean score of lifestyle modification and its domains (health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations and stress management) are significantly higher than pre-implementation of program (P ≤ 0.001).

Figure (3): illustrates that, at pre-implementation of program, (38.5%) of studied women had satisfactory level of total lifestyle modification. However, 4 weeks post-implementation of program, (71.2%) of studied women had satisfactory level of total lifestyle modification.

Table (6) shows that there was a highly statistical significant positive correlation between total knowledge score and total scores of (lifestyle modification and TPB constructs) before and after implementation of program (P ≤ 0.001).

Table (1) Distribution of the studied women according to their personal characteristics (n=52).

Personal characteristics	No	%
Age (in years):		
20– 29	8	15.4
30 – 39	21	40.4
40 – 49	13	25.0
≥50	10	19.2
Mean ± SD = 40.83±8.79		
Residence:		
Countryside	31	59.6
City	21	40.4
Level of education:		
Read/write	1	1.9
Primary education	2	3.9
Secondary or technical education	28	53.9
University education	21	40.3
Occupation:		
Worker	3	5.8
Employee	45	86.5
Head of office	4	7.7
Monthly income:		
Insufficient	32	61.5
Fairly sufficient	12	23.1
Sufficient	8	15.4
Family history of cervical cancer:		
Yes	2	3.8
No	50	96.2

Table (2): Distribution of studied women regarding their knowledge about cervical cancer screening before and after implementation (n=52).

Knowledge items	Pre- implementation				4 weeks post-implementation				X^2	P-value
	Correct answer		Incorrect answer		Correct answer		Incorrect answer			
	No	%	No	%	No	%	No	%		
Definition of cervical cancer	39	75.0	13	25.0	51	98.1	1	1.9	**11.88**	**0.001****
Risk factors of cervical cancer	25	48.1	27	51.9	41	78.8	11	21.2	**10.61**	**0.001****
Causes of cervical cancer	18	34.6	34	65.4	35	67.3	17	32.7	**11.11**	**0.001****
Signs and symptoms of cervical cancer	13	25.0	39	75.0	29	55.8	23	44.2	**10.22**	**0.001****
Complications of cervical cancer	11	21.2	41	78.8	30	57.7	22	42.3	**14.53**	**0.000****
Diagnosis of cervical cancer	16	30.8	36	69.2	33	63.5	19	36.5	**11.15**	**0.001****
Prevention methods of cervical cancer	22	42.3	30	57.7	43	82.7	9	17.3	**18.09**	**0.000****
Human papilloma virus vaccination	10	19.2	42	80.8	28	53.8	24	46.2	**13.43**	**0.000****
Screening methods of cervical cancer	14	26.9	38	73.1	35	67.3	17	32.7	**17.01**	**0.000****
Pap smear screening	12	23.1	40	76.9	33	63.5	19	36.5	**17.27**	**0.000****
Appropriate age for screening for married women	10	19.2	42	80.8	32	61.5	20	38.5	**19.33**	**0.000****
Importance of cervical cancer screening	19	36.5	33	63.5	40	76.9	12	23.1	**17.27**	**0.000****
Treatment methods of cervical cancer	35	67.3	17	32.7	50	96.2	2	3.8	**14.48**	**0.000****
Side effects of chemotherapy and radiotherapy	30	57.7	22	42.3	48	92.3	4	7.7	**16.61**	**0.000****

*A Statistical significant $p \leq 0.0$ **A Highly Statistical significant $p \leq 0.001$

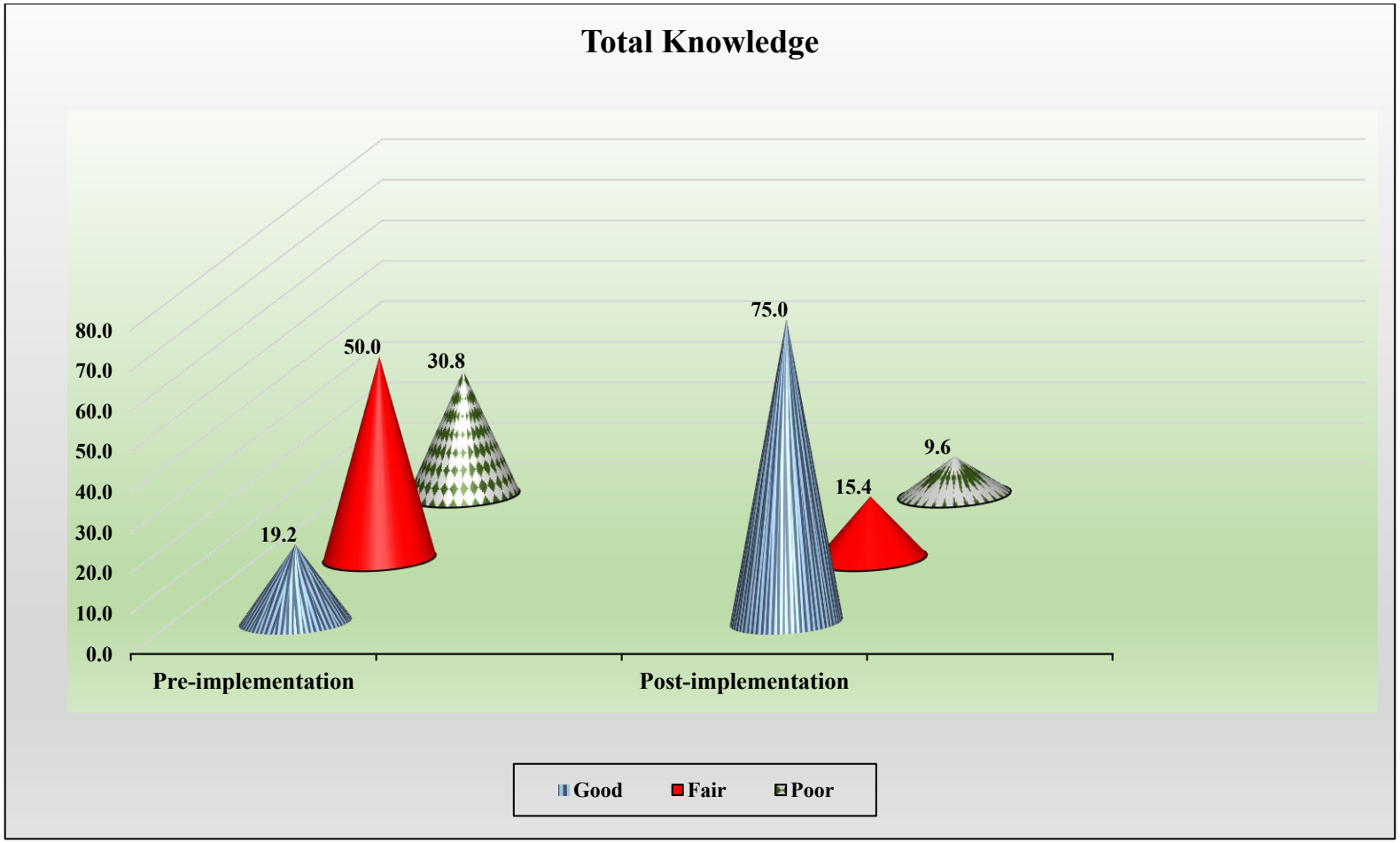

Figure (1): Percentage distribution of studied women regarding their total knowledge score regarding cervical cancer screening before and after implementation (n=52).

Table (3): Mean scores of the components of studied women's Theory of planned behavior model (attitude, subjective norms, perceived behavioral control, behavioral intention) regarding cervical cancer screening before and after implementation (n=52).

TPB construct	Pre- implementation	4 weeks post-implementation	Paired t-test	P-value
	Mean ± SD	Mean ± SD		
Behavior attitude				
A. Positive attitude				
I think it's crucial to get information about cervical cancer screening.	2.92±0.78	3.44±0.60	4.52	0.000**
I believe regular cervical cancer screening can provide me with peace of mind about my health.	1.85±0.87	2.65±0.68	9.28	0.000**
I think cervical cancer screening can help reduce the incidence.	2.44±0.91	3.08±0.71	9.41	0.000**
I think cervical cancer screening can help reduce mortality.	2.13±0.65	2.87±0.56	11.76	0.000**
Through cervical cancer screening, in my opinion, cervical disease can be identified early.	2.90±0.93	3.42±0.66	7.42	0.000**
I will regret if I miss or fail to engage in a cervical cancer screening program.	1.85±1.16	2.69±.89	6.66	0.000**
I think all eligible women should have regular cervical cancer screening.	1.42±1.01	2.60±0.91	9.61	0.000**
Cervical cancer is a disease for prostitutes.	3.29±.63	3.60±0.49	4.76	0.000**
B. Negative attitude				
The thought of cervical cancer scares me.	0.88±0.54	2.29±0.77	15.23	0.000**
If there is cancer development in my destiny, having cervical exams will not prevent it.	1.35±1.13	1.96±0.90	9.03	0.000**
I feel I will get cervical cancer some time during my life.	2.21±0.97	2.92±0.83	11.21	0.000**
If I developed cervical cancer, I would not live longer than 5 years.	0.98±0.89	1.81±0.59	9.65	0.000**
Cervical cancer would threaten a relationship with my spouse or sexual partner.	1.56±0.93	2.06±0.85	7.14	0.000**
Having cervical exams takes too much time.	2.31±1.09	3.00±0.88	10.71	0.000**
Having cervical exams is too painful.	1.81±0.74	2.42±0.80	9.03	0.000**
Healthcare workers doing cervical exams are rude to women.	3.21±0.60	3.62±0.66	5.87	0.000**
I have other problems more important than having cervical exams in my life.	1.27±0.91	2.00±0.62	6.62	0.000**
I am too old to have cervical exams regularly.	3.27±0.66	3.79±0.41	7.42	0.000**
There is no health center close to my house to have cervical exams.	0.60±0.66	1.31±1.00	8.05	0.000**
I will never have cervical exams if I have to pay for it.	2.04±1.32	2.46±1.12	6.11	0.000**
I would be ashamed to lie on a gynecologic examination table and show my private parts to have a cervical exam	0.87±0.56	1.62±0.66	6.64	0.000**
Talking to family/friends about symptoms of cervical cancers is embarrassing	2.13±1.12	2.56±0.93	6.11	0.000**

Table (3) Cont'd: Mean scores of the components of studied women's Theory of planned behavior model (attitude, subjective norms, perceived behavioral control, behavioral intention) regarding cervical cancer screening before and after implementation (n=52).

Subjective norms				
If I have a cervical cancer screening, my husband will be supportive.	1.40±0.91	1.94±1.03	7.71	0.000**
My family believe I should be screened for cervical cancer.	0.38±0.66	0.79±0.97	5..87	0.000**
My friends encourage me to get screened for cervical cancer.	0.29±0.45	0.90±0.69	6.71	0.000**
I would like to take advice from someone close to me for cervical cancer screening.	2.10±0.82	2.63±1.03	5.55	0.000**
I believe that the guidance from my doctor is crucial for my cervical cancer screening.	2.50±0.67	3.31±0.64	7.58	0.000**
I am willing to accept the arrangement of community/company for cervical cancer screening.	2.31±0.64	2.82±0.87	7.42	0.000**
Perceived behavioral control				
I believe the decision to have cervical cancer screening is entirely up to me.	2.35±0.81	2.65±1.04	4.76	0.000**
I will not be embarrassed to get screened for cervical cancer.	1.60±1.01	2.19±0.97	8.67	0.000**
I'd prefer to be screened by a woman doctor.	3.17±0.61	3.46±0.69	4.54	0.000**
I'm going to get checked for cervical cancer even if I'm healthy.	2.50±0.67	3.31±0.46	7.58	0.000**
I will still have the cervical cancer screening even though it may be uncomfortable.	1.06±0.72	1.71±0.45	5.63	0.000**
I will participate in cervical cancer screening if it can be more convenient.	3.12±0.70	3.42±0.66	4.76	0.000**
I choose not to know if cancer is detected.	1.88±0.83	2.40±0.66	7.42	0.000**
Behavioral intention				
I'm willing to have a cervical cancer screening now that I have learned the necessary details.	2.56±0.69	3.06±0.85	7.14	0.000**
If possible, in the future, I would be open to getting screened for cervical cancer.	2.88±0.70	3.29±0.45	5.87	0.000**
I will definitely have regular cervical cancer screening.	1.85±0.87	2.37±0.68	7.42	0.000**
Total score	**73.61±9.34**	**96.51±4.94**	**18.90**	**0.000****

*A Statistical significant $p \leq 0.0$ **A Highly Statistical significant $p \leq 0.001$

Table (4): Total mean scores of the components of studied women's Theory of planned behavior model regarding cervical cancer screening before and after implementation (n=52).

TPB construct	No. of items	Min./Max. score	Pre-implementation Mean ± SD	4 weeks post-implementation Mean ± SD	Paired t-test	P-value
Behavior attitude	22	0/88	43.28±6.76	58.15±3.99	20.63	0.000**
Subjective norms	6	0/24	8.98±1.74	12.40±2.26	13.41	0.000**
Perceived behavioral control	7	0/28	14.05±1.58	17.25±1.66	11.18	0.000**
Behavioral intention	3	0/12	7.28±1.84	8.71±1.45	9.91	0.000**
Total score	**38**	**0/152**	**73.61±9.34**	**96.51±4.94**	**18.90**	**0.000****

*A Statistical significant p ≤ 0.0 **A Highly Statistical significant p ≤ 0.001

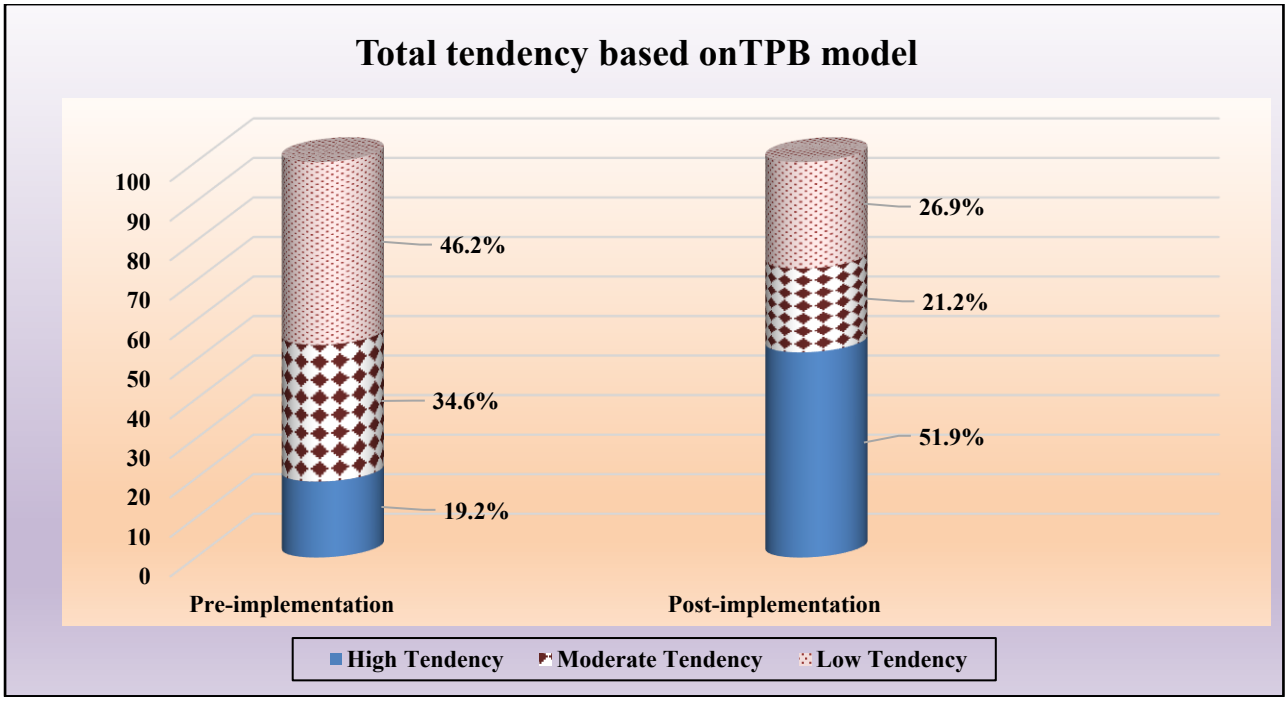

Figure (2): Percentage distribution of studied women regarding their total tendency score regarding cervical cancer screening based on TPB model before and after implementation (n=52).

Table (5): Mean scores of studied women's lifestyle modification before and after implementation (n=52).

Lifestyle modification domains	No. of items	Min./Max. score	Pre-implementation	4 weeks post-implementation	Paired t-test	P-value
			Mean ± SD	Mean ± SD		
Health responsibility	9	9/36	17.12±4.17	20.65±5.33	7.60	0.000**
Physical activity	8	8/32	16.00±3.40	23.78±4.49	21.11	0.000**
Nutrition	9	9/36	17.17±4.23	24.51±5.72	16.78	0.000**
Spiritual growth	9	9/36	22.92±5.33	30.30±2.76	17.28	0.000**
Interpersonal relations	9	9/36	25.21±4.15	31.67±3.00	32.48	0.000**
Stress management	8	8/32	26.79±2.04	30.65±1.04	14.14	0.000**
Total score	**52**	**52/208**	**125.21±10.44**	**140.94±6.39**	**14.11**	**0.000****

*A Statistical significant p ≤ 0.0 **A Highly Statistical significant p ≤ 0.001

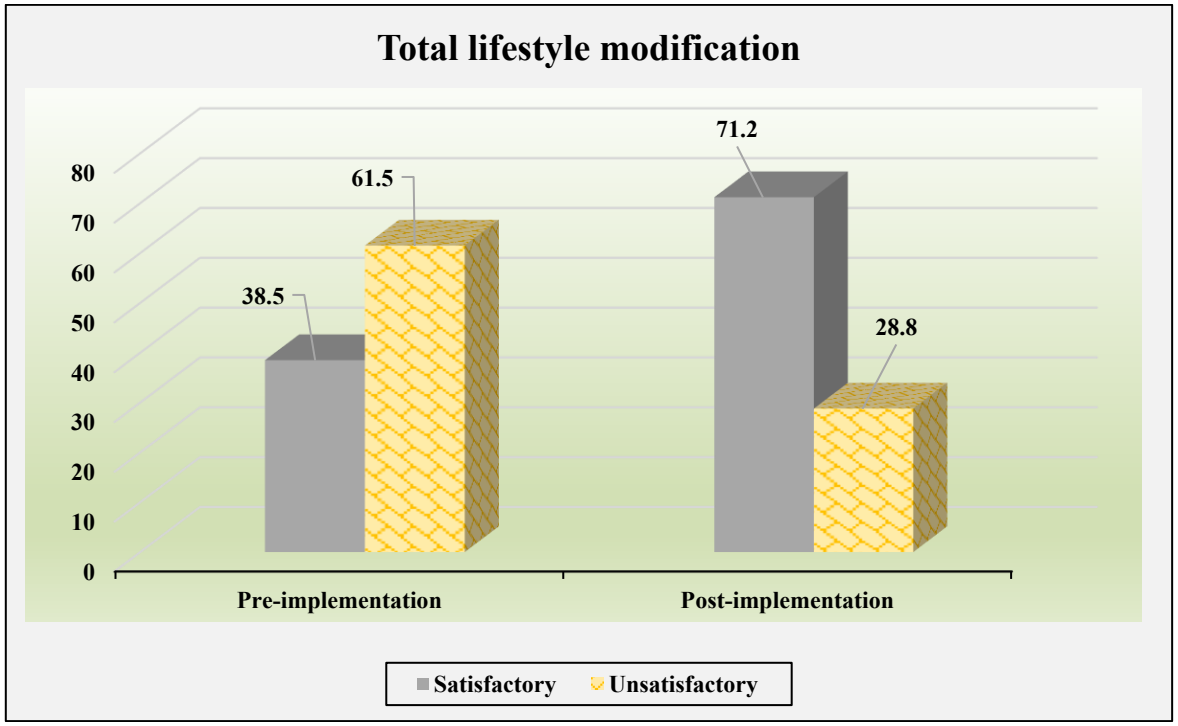

Figure (3): Percentage distribution of studied women regarding their total lifestyle modification before and after implementation (n=52).

Table (6): Correlation between total knowledge score and total scores of (lifestyle modification and TPB constructs) of the studied women regarding cervical cancer screening before and after implementation (n=52).

Variables	Total knowledge score			
	Pre- implementation		4 weeks post-implementation	
	r	P-value	r	P-value
Total lifestyle modification score	0.582	0.000**	0.519	.000**
Total TPB constructs score	0.416	0.000**	0.627	.000**

**A Highly Statistical significant ($p \leq 0.001$)

Discussion

Cervical cancer is a highly prevalent disease amongst women, associated with significant morbidity and mortality worldwide. Screening can detect pre-cancerous lesions that can be treated, thereby preventing the development of potentially fatal disease ***(Gibson-Helm et al., 2023).*** The fundamental principle of CCS is the detection of the disease at an early curable stage in asymptomatic, apparently healthy women ***(D'Augè et al., 2023).*** For women, maintaining a stable healthy lifestyle and lifestyle improvement are crucial for preventing the occurrence of CC ***(Chen et al., 2023).*** The theory of planned behavior is recognized as a comprehensive model and effective theory for behavioral change. Educational interventions based on TPB can lead to sustainable behavioral modifications ***(Ghasemian et al., 2024).*** Therefore, the current study aimed to evaluate the effect of educational program based on theory of planned behavior on cervical cancer screening and lifestyle modification among women.

According to personal characteristics of the studied women, the results of the current study displayed that more than two fifths of studied women were in age group of 30 – 39 years old with the mean age of 40.83±8.79 years. Concerning residence, more than half of studied women lived in countryside. Pertaining to the level of education, it was illustrated that more than half of studied women had secondary or technical education. As far as, the majority, less than two thirds of studied women were employee and had insufficient monthly income, respectively. In addition, the majority of studied women hadn't family history of cervical cancer.

These results were consistent with ***Yadav et al., (2024)*** a study in India and demonstrated that the women had a higher proportion of the age group 35 – 49 years, constituted around (36.5%), with the highest proportion of women educated till secondary (50.2 %). Moreover, these results were congruent with ***Abd El-hamed, (2023)*** and showed that the mean age 44.12 ± 3.14 years. (73.2% & 72.7%) of them lived in a rural area and had secondary educational level, respectively. Additionally, agreed with ***Abdel Rahman et al., (2023)*** and indicated that shown that more than half of them were ranged between 20 to 39 years old with a mean age of 36.75 ±11.17 years, more than half of them had secondary education and less than two thirds of them were coming from urban regions. Also, these results were in agreement with ***Amin et al., (2023)*** and revealed that (99.1%) didn't have family history of cervical cancer or human papillomavirus. Furthermore, these results were supported by study carried out in China by ***Xin et al., (2023)*** and elaborated that the majority (95.8%) had no family history of cervical cancer.

Knowledge of cervical cancer is important because it is one of the most easily preventable forms of cancer if early screening and diagnosis are made. Low awareness level about CC, risk factors, beliefs, poor access to preventive services and unaffordability of the service can all affect the decision to seek health care services for CCS ***(Nwachukwu et al, 2023).*** **Regarding knowledge of the studied women about cervical cancer screening,** the results of the current study clarified that there was a highly statistically significant differences in relation to all items of studied women's knowledge regarding cervical cancer screening before and after implementation of educational program ($P \leq 0.001$). This indicated that the educational program based on theory of planned behavior positively impacted women's knowledge on the importance of taking proactive steps by identifying risk factors to prevent CC and motivate them to perform cervical cancer screening.

These results in accordance with ***Osman et al., (2023***) and demonstrated a satisfactory level of knowledge in the post-test than pre-test with statistically significant differences ($P < 0.001$). Moreover, these results went in the same line with ***Yakout et al., (2022)*** and portrayed a statistically significant difference was observed among the study group in pre and post test ($P < 0.001$) according to their total score of knowledge about cervical cancer screening. Additionally, these results were congruent with ***Eghbal et al., (2020)*** and elaborated that there was a significant difference in the mean scores of knowledge regarding cervical cancer screening in two groups after the intervention of educational program ($p < 0.001$).

Basic knowledge of cervical cancer screening is vital in early detection and reduction in mortality among women ***(Yadav et al., 2024).*** **Concerning studied women's total knowledge score regarding cervical cancer screening,** the results of the current study revealed that at pre-implementation of program, less than one fifth of studied women had good knowledge regarding cervical cancer screening. This might be due to lack of awareness about CCS, absence of a well-structured CCS scheme in Egypt and the majority of studied women hadn't family history of CC. Moreover, health care centers do not offer any cervical cancer screening programs due to shortages in highly qualified health care providers and financial resources. This result was nearly similar to a study carried out in India by ***Karena and Faldu, (2024)*** and pointed out that only (28.8%) of the participants had adequate and comprehensive knowledge of cervical cancer screening. Furthermore, this result was congruent with ***Aziz et al., (2022)*** and discovered that approximately two-thirds of the women studied had inadequate knowledge about cervical cancer screening. The most prevalent barriers preventing women from participating in CCS included lack of knowledge, feel uncomfortable with the idea of vaginal examination, anxiety about the test results and absence of cervical cancer symptoms.

However, 4 weeks post-implementation of program, three quarter of studied women had good knowledge regarding cervical cancer screening. This finding was supported the study hypothesis which stated that "The studied women will exhibit improved knowledge after implementation of educational program based on theory of planned behavior than before". This could be due to the fact that all of the women are interested in learning about cervical cancer screening, as well as the use of images, PowerPoint slideshows, online and offline video and illustrated booklet with colored pictures to draw attention for educating women during the implementation. Furthermore, good communication and direct interaction with the women allows for clarification of anything that is unclear and acquire essential knowledge.

This result agreed with ***Abd El-hamed, (2023)*** study in Egypt and illustrated that (17%) of the studied women had adequate knowledge levels toward cervical cancer screening pre-program while post-program increased to (84.7%) with highly statistically significance differences (P

value ≤ 0.001). Additionally, This result goes in the same line with a study carried out in Egypt by ***Ahmed et al., (2023)*** and reported that the mean total knowledge score rise from 19.1±14.7 at baseline to 35.3±9.3 post-intervention (p<0.0001). Overall, good and fair knowledge scores significantly increased by 6.1% and 41.1%, respectively post-intervention (p<0.0001) about cervical cancer and screening. Furthermore, this result was supported by ***Fawzy et al., (2023)*** and showed that more than two-thirds of the participant women had good knowledge regarding cervical cancer screening, with significant differences before and after implementing the educational program.

The theory of planned behavior is an intention model used to understand and explain healthy behavior by influencing attitude, subjective norms and perceived behavioral control to solve the problem of insufficient intention to health behavior ***(Ellis and Helaire, 2023).*** **In relation to the components of studied women's Theory of planned behavior model regarding cervical cancer screening,** the results of the current study showed that there was there was a highly statistically significant improvement in relation to all constructs of theory of planned behavior domains related to behavior attitude, subjective norms, perceived behavioral control and behavioral intention after implementation of program more than before (P ≤ 0.001). This reflected that health education about cervical cancer screening to women might increase their knowledge and awareness of the disease, subsequently increasing the accessibility and practice. Women's attitude and willingness towards cervical cancer would reflect a positive attitude to increasing cervical cancer screening. Favorable attitudes, high subjective norms and greater control of behavior were the important factors that resulted in increased intention. Therefore, the woman was more likely to undergo CCS measures.

These results were congruent with the study of ***Sarvestani et al., (2021)*** in Iran and clarified that there was a significant increase observed in the means of attitude, subjective norms, perceived behavioral control and behavioral intention in the intervention group compared to the control group after the educational intervention based on theory of planned behavior, indicated that this difference was statistically significant which consequently caused the promotion of performance of the Pap smear test of the studied women. Moreover, these results were supported by ***Jeihooni et al., (2021)*** and revealed that the mean score of perceived susceptibility, perceived severity, perceived benefits, perceived behavioral control, subjective norms, and behavioral intention were significantly increased in the experimental group after intervention of educational program on doing pap-smear test among women (P < 0.05). Furthermore, these results are in accordance with ***Zandi et al., (2023)*** and pointed out that TPB values improved significantly in the intervention group (p < 0.05) after the educational intervention, while changes were not significant in the control group.

A successful implementation of cervical cancer screening programs is effective in reducing cervical cancer ***(Koca and Açıkgöz, 2023).*** **According to studied women regarding their total tendency score regarding cervical cancer screening based on TPB model,** the results of the current study elaborated that there was at pre-implementation of program, less than one fifth of studied women had high tendency regarding cervical cancer screening. The low tendency level about CCS may be attributed to the fact that the most of studied women lived in countryside and low level of awareness that is caused by cultural beliefs, religious practices and limited access to healthcare services. This result in accordance with study carried out in South Africa by ***Gwavu et al., (2023)*** and discovered that the women had undesirable attitudes regarding cervical cancer and Pap smear screening. Therefore, specific interventions to improve the uptake of cervical screenings are advocated for.

However, 4 weeks post-implementation of program, more than half of studied women had had high tendency regarding cervical cancer screening. This finding was supported the study hypothesis which stated that "The studied women will exhibit better tendency for cervical cancer screening that reflected through improved (attitude, subjective norms, perceived behavioral control and behavioral intention) after implementation of educational program based on theory of planned behavior than before". This could be attributed to the great effect of educational program based on the TPB, which provided the women with the critical information and advice that changed their health attitudes and preventative actions, effectively improved the intention and ultimately leading to behavioral change towards CCS.

These results were supported by ***Shojaeizadeh et al., (2023)*** and displayed that the main finding of the study was changing in the participants' health behavior so that majority of them (81.4%) proceeded to do Pap test while they had never done Pap test previously. Moreover, These results goes in the same line with ***Fawzy et al., (2023)*** and demonstrated that (62%) of the studied women had a positive attitude regarding cervical cancer screening before the educational program but it increased to (82%) post-implementation of an educational program. Furthermore, these results were consistent with ***Sarvestani et al., (2021)*** and indicated an increase in the women's performance of the Pap smear screening test by appropriate planning, provision of educational packages based on the women's needs and using effective subjective norms.

Lifestyle modification has the cornerstone role in the primary prevention of cervical cancer ***(Nazari et al., 2023)***. **As regards to studied women's lifestyle modification,** the results of the current study demonstrated that, at post-implementation of program; the total mean score of lifestyle modification and its domains (health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations and stress management) are significantly higher than pre-implementation of program ($P \leq 0.001$). This can be linked to healthy behaviors can be promoted by raising women's knowledge of their health and the factors impacting it. Increased healthy knowledge is crucial because it motivates women to act in ways that are better for their overall health for prevention of cervical cancer. These results were nearly similar to a study carried out in Brazil by ***Di and Wang, (2023)*** and reported that the lifestyle scores of self-realization, interpersonal relationship, nutrition, physical activity, health responsibility and stress management all significantly higher in education group than those in control group ($P>0.05$) after health education mode based on the theory of planned behavior. Additionally, these results agreed with ***Nazari et al., (2023)*** and proved that a diet and rich nutrition can be helpful for the prevention of cervical cancer and may reduce the risk of disease. Furthermore, these results nearly similar to ***Ibrahim et al., (2021)*** and elaborated that, there was a highly statistical significant difference regarding all health promotion lifestyle profile-II items (health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations and stress management) between study and control groups after program implementation ($P < 0.001$).

Concerning studied women regarding their total lifestyle modification, the results of the current study illustrated that, at pre-implementation of program, more than one third of studied women had satisfactory level of total lifestyle modification. This might be due to lack of awareness about the importance of healthy nutrition, adequate exercises and good stress management. However, 4 weeks post-implementation of program, less than three quarters of studied women had satisfactory level of total lifestyle modification. This finding was supported the study hypothesis which stated that "The studied women will exhibit more lifestyle modification after implementation of educational program based on theory of planned behavior than before". This could be due to that high knowledge level increase women's awareness

about healthy practices so that increasing their adherence to healthy lifestyle practice such as healthy nutrition and proper exercise. These results were consistent with ***Osman et al., (2023)*** study and pointed out that the mean score increased from 15.49 (SD=2.99) in the pre-test to 16.76 (SD=3.05) in the post-test, indicated increased understanding of various strategies that promote a healthy lifestyle to reduce the modifiable risk cervical cancer. Additionally, these results were consistent with ***Ibrahim et al., (2021)*** and revealed that, total health promotion lifestyle profile-II improved from (20%) before program implementation to (64.4%) after program implementation among study group.

Regarding correlation between total knowledge score and total scores of (lifestyle modification and TPB constructs) of the studied women regarding cervical cancer screening, the result of the current study displayed that there was a highly statistical significant positive correlation between total knowledge score and total scores of (lifestyle modification and TPB constructs) before and after implementation of program ($P \leq 0.001$). This might be due to that increased knowledge and perceived power helps women to evaluate their control behaviors positively and empowers them to create capabilities against social norms that can compete with the use of CCS services, as well as build positive attitudes, accept counseling of health professionals, therefore implement CCS practice. Furthermore, women's awareness and positive attitude have the main role on improving healthy lifestyle that associated with better quality of life. This result in accordance with ***Ibrahim et al., (2021)*** and displayed that there was positive statistically significant correlation between knowledge and health promotion lifestyle among studied women in the study group after program implementation ($P < 0.001$). Moreover, this result was congruent with ***El Sayed et al., (2020)*** and illustrated a positive highly statistically significant correlation ($P \leq 0.001$) between the women's self-care behaviors and their total knowledge scores before and after the intervention based on planned behavioral theory.

Conclusion

Based on the results of the current research, it can be proved that; the educational program based on theory of planned behavior was notably effective in enhancing knowledge, attitude, subjective norms, perceived behavioral control and behavioral intention toward cervical cancer screening among women. Moreover, the findings highlighted the importance of TPB as a useful framework in promoting lifestyle modification regarding cervical cancer prevention. Furthermore, that there was a highly statistical significant positive correlation between total knowledge score and total scores of (lifestyle modification and TPB constructs) before and after implementation of program ($P \leq 0.001$). Therefore, the research hypotheses were supported and the research aims were achieved.

Recommendations

- The theory of planned behavior could be beneficial integrated as an effective health promotion model for cervical cancer screening and prevention.
- Develop simple clarified educational programs that focused on promoting healthy behaviors for preventing cervical cancer.
- Organize periodically screening programs, scaling up health education, social mobilization and Human Papillomavirus vaccinations to support screening, prevention and early detection of cervical cancer among married women.
- There is an urgent need to targeted awareness and enlightenment on cervical cancer screening is highly recommended for early detection which guarantees good treatment outcomes to reduce the associated mortality and morbidity.

- Distribution of the booklets regarding cervical cancer screening for women attending to outpatient clinics to improve women's knowledge, attitude and practice as well as promote healthy lifestyle.

Further researches:

- Training workshops about CCS for maternity nurses should be conducted at regular intervals to improve their perception to raise the awareness regarding early detection and prevention of cervical cancer.
- Further research is crucial to conduct a similar study on larger sample size in different settings for generalization of the findings.

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