- *Basic Research*

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

Salma Hussein Mohammed Aboelfottoh[1], Shaimaa Hashem Elsalous[2], Mona Abdallah Abdel-Mordy[3], Ola Abdel-Wahab Afifi Araby[4]

[1]Lecturer of Obstetrics & Gynecological Nursing, Faculty of Nursing, Benha University, Egypt
[2]Lecturer of Maternity and Newborn Health Nursing -Faculty of Nursing-Helwan University
[3]Assistant Professor of Community Health Nursing, Faculty of Nursing, Benha University, Egypt
[4]Assistant Professor of Obstetrics & Gynecological Nursing, Faculty of Nursing, Benha University, Egypt

Abstract

Background: Cancer of the cervix poses an immense danger to the lives of women. Lifestyle modifications, in conjunction with cervical cancer screening, are indispensable for the early detection and prevention of cervical cancer. The planned behaviora theory is a framework that is frequently implemented to anticipate and understand health behaviours. *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:* From the aforementioned study setting, 52 women (administrative employees) were chosen as a purposive sample. *Tools:* A structured self-administered questionnaire, Theory of Planned Behavior constructs questionnaire and Health-Promoting Lifestyle Profile II. *Results:* Following the educational program grounded in theory of planned behavior, women's knowledge, theory of planned behavior constructs, and overall lifestyle modification differed significantly. Significant differences were found statistically. The total knowledge score was positively correlated with the total scores of the attitude, lifestyle modification, and TPB constructs before and after the program was implemented, and this correlation was highly statistically significant. *Conclusion:* knowledge, attitude, subjective norms perceived behavioral control, and behavioral intention, among women regarding cervical cancer screening were all significantly affected by the educational program, as per the theory of planned behavior. Evidence from this study shows that TPB is an effective strategy for lowering cervical cancer risk via lifestyle modification. *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)*. Women in their middle years and later years are disproportionately at risk for cervical cancer, which has been steadily rising in incidence rates over the last decade. The lack of regular cervical screening programs and changes in lifestyle are to blame for this. *(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).*

HPV is one of the primary causes of CC and poses a threat to the life of women. An additional risk factors are the use of oral contraceptives, high parity, smoking and alcoholism, co-infections, immunosuppression, specific dietary deficiencies, commencing sexual activity at a young age, and having multiple sexual partners. The majority of instances may initially be asymptomatic; however, in the future, symptoms may include anomalous vaginal bleeding and abnormal pain that is exacerbated by sexual intercourse *(Gwavu et al., 2023).*

Cervical cancer is the most susceptible to prevention through screening among all malignant malignancies. The goal of cervical cancer screening (CCS) has long been to detect cellular alterations associated with precancerous cervical lesions—ideally before women experience any symptoms of the disease through cytological testing, more commonly known as Pap smear. Human papillomavirus (HPV) may induce these cellular modifications. Newer, high-quality evidence has confirmed the efficacy of CCS strategies that are predicated on the detection of HPV *(Nothacker et al., 2022).*

Screening programs for cervical cancer are crucial for improved prognosis and long-term survival, as they serve as an effective secondary prevention strategy *(Koca and Açıkgöz, 2023).* The mortality and morbidity rates have been reduced because of the early identification of CC. Screening programs that are effective have the potential to drastically reduce the risk of CC. Not only can sexual education and HPV infection prevention help reduce the likelihood of this type of neoplasm, but the HPV vaccine, changes to one's lifestyle, and the use of contraceptives are also important. To detect precancerous lesions or tumors in the early phases, high-risk women may undergo cervical cell screening and DNA-HPV testing as a secondary approach to preventing CC *(Basoya and Anjankar, 2022).*

The risk of cervical cancer commences to rise at approximately the age of 30 and remains elevated for the duration of one's life. Consequently, it is advised that women between the ages of 25 and 65 undergo CCS at least every five years *(Perkins et al., 2023).* Every three years, women who are HIV positive should undergo screenings, commencing at the age of 25. A minimum of two lifetime screenings with a high-performance HPV test is recommended by the global strategy, with the first screening occurring by the age of 35 and the second test occurring by the age of 45. Even if a woman has been vaccinated against HPV, regular CCS is crucial because precancers rarely elicit symptoms *(World Health Organization, 2023).* As many as 90% of cervical cancer patients will have gotten treatment by 2030, and 70% of women will have undergone a high-performance test between the ages of 35 and 45. Additionally, 90 percent of girls will have received a full HPV vaccine by the age of fifteen, as per the World Health Organization (WHO). This proposal is applicable on a global scale. This has the potential to prevent 5 million related fatalities and reduce the number of new cervical cancer cases by more than 40% by 2050 *(World Health Organization, 2022).* The recommended CCS has been enhanced through the use of implementation strategies, such as educational materials, reminder calls, and invitation letters *(Bonuck et al., 2023).*

A mere 5% of women in developing countries undergo cervical screening, in contrast to 40-50% in developed countries *(Omoyeni and Tsoka-Gwegweni, 2022).* The current standard of

care for cervical cancer screening is facing numerous challenges. Structural obstacles consist of inadequate infrastructure, financial constraints, and limited personnel qualifications. Women face a multitude of challenges when it comes to cervical cancer screening, including cultural beliefs, embarrassment, social stigma, lack of spouse support, lack of knowledge, screening cost, privacy concerns, pain, misunderstandings, low prioritization of CC, women's poor health, and perceived fear of screening procedures and negative outcomes *(Asare et al., 2024).* Adopting a healthful lifestyle can prevent cervical cancer. This involves the following: adhering to good hygiene practices, engaging in regular physical activity, maintaining a healthy weight, ceasing smoking, managing stress, consuming a nutritious diet that is abundant in fruits and vegetables, and adopting secure sexual practices *(Uniyal, 2022).* It is believed that the adoption of healthful lifestyles could prevent approximately 40% of cancers. Behavioral interventions must be embraced by women in order to be effective in enhancing lifestyle behaviours. Because they are able to reach women repeatedly over time, cancer screening programs are great places to suggest models that can encourage healthy lifestyles. Motivating women to induce positive lifestyle modifications in their lives is the ultimate goal *(Riggi et al. 2022).*

The theory of planned behavior (TPB) is a critical model of behavioral change (cognitive-social model of value expectation) that has been devised by Ajzen and Fishbein in 1980 and is applicable to the prediction and comprehension of behaviors. Perceived behavioral control, subjective norms, and the woman's attitude toward the behavior are all considered separate constructs that impact intention, the primary factor in determining behavior. *(Jeihooni et al., 2023).* TPB has been widely used to guide research in cancer screening–related behavior. For cervical cancer, two reliable and valid screening methods are the papanicolaou test and the HPV test. *(An and Vincent, 2022).*

For the purpose of early cancer detection, nurses are instrumental in the promotion of CCS. One of the most frequently employed behavioral theories, the TPB, has been employed to comprehend, anticipate, and modify behaviors associated with cancer screening *(An and Vincent, 2022).* Maternity nurses played a critical role in the cervical cancer screening process due to their central location within the health care delivery system. Timely and personalized information can help women in raising awareness and positive outlook about the necessity of cervical cancer screening, encourage screening on a regular basis, and speed up the process of early detection. A lower incidence of cervical cancer and its complications will result from this in the long run *(Abd El-hamed, 2023; Hamdar et al., 2023).* In order to mitigate the risk of CC, it is crucial to educate women about preventable risk factors such as the use of condoms, maintaining a single sexual partner, and refraining from smoking. When high-risk behaviors are identified, nurses should help women identify and anticipate lifestyle adjustments that can reduce the risk of CC *(Tyerman et al, 2022).*

Significance of the research

Gynecological cancers continue to be a global concern, as their incidence and cancer-related mortality remain excessively high. Cervical cancer accounts for 6.5% of all of these cases *(D'Augè et al., 2023).* Cancer of the cervix ranks thirteenth leading cause of female cancer and twelfth leading cause of cancer deaths of female cancer deaths in Egypt. When it comes to cancers affecting women in Egypt, the tenth most common is cervical cancer in the 19–44 age group. in 2020, the current estimates put the yearly number of cervical cancer cases in Egypt at around 1,320, with around 744 cervical cancer deaths recorded in the same year *(Yakout et al., 2022).* High parity (> 4) and CC were also found to have a significant correlation. A persistent infection with oncogenic HPV is acknowledged as the primary cause of CC in Egypt *(Ismail et al., 2023).*

In low-resource countries, the mortality rate from cervical cancer is 18 times higher. Egypt has not implemented any national screening or HPV vaccination programs to date. Despite

being the most precise screening test, the HPV-DNA test remains prohibitively expensive and unavailable in our low-resource countries *(Hemida et al., 2023)*. The estimated number of cervical cancer fatalities that could be prevented by cervical cancer screening is 70% *(Wilding et al., 2023)*. The implementation of an educational program on cervical cancer screening is significant because it can assist in bridging the knowledge gap, empower women to take responsibility for their health, assist them in adopting preventive measures, and assist them in seeking timely medical care, thereby reducing morbidity and mortality rates *(Osman et al., 2023)*. The TPB-based health education mode supports the implementation of perceived behavioral control, the scientific enhancement of women's positive attitudes and subjective norms toward healthy lifestyles. This approach aims to improve the quality of life and enhance the women's behavioral intentions *(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. We will accomplish this aim by implementing the subsequent objectives:

1. Assess women's knowledge regarding cervical cancer screening.
2. Evaluate 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. Execute an educational program that is grounded in the 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: references the examination of the female body for cervical cancer prior to the onset of symptoms. Ultimately, this can contribute to the reduction of overall mortality by facilitating the diagnosis and treatment of cervical cancer at an early stage. CCS now encompasses both the HPV and Pap screening testing.

Lifestyle modification: Refers to the most significant and effective approach toward reducing the incidence of cervical cancer by adopting a healthy lifestyle and refraining from harmful behaviors.

Operational definition:

Theory of planned behavior: references a behavioral theory that has been extensively implemented in the field of clinical nursing in recent years. Behavioral intention is the primary factor that determines behavior and is indicative of the extent to which a woman is willing to engage in a specific behavior. Behavior intention is contingent upon subjective norms, behavioral attitudes, and perceived behavioral control. Behavioral attitudes refer to the positive or negative evaluations of behaviors that women hold, subjective norms are the social pressures that women perceive in specific behaviors, and perceived behavioral control is the woman's previous experience and anticipated obstruction to cervical cancer screening.

Subjects and method

Research Design:

Quasi-experimental research design, a one-group, pre- and post-test was used to achieve the research aim. As a quasi-experiment, a one-group pretest-posttest design involves measuring the outcome of interest twice. An intervention is administered to a non-random group of participants both before and after. In a directional manner, the research employs a pre-test and post-test study design. The dependent variable is evaluated before and after an intervention using an independent variable in this design. This serves as an advantage **(Choueiry, 2021).**

Study Setting:

In the Faculty of Nursing at Benha University in the Qaliobya governorate of Egypt, the study was conducted. The Higher Institute of Nursing, which is affiliated with the Faculty of Human Medicine at Zagazig University, Banha Branch, was the moniker for the Faculty of Nursing. The Higher Institute was subsequently transferred to the Faculty of Nursing at Zagazig University, Banha Branch, pursuant to a presidential decision. 51 female pupils commenced their studies at the college during the academic year 1993/1994. The initial bachelor's degree cohort graduated in 1997, with 27 female students. The master's degree in nursing was initiated in 1994 with seven female students, and the doctoral degree in nursing sciences was initiated in 1995 with three female students. Study and registration for these programs commenced in 1994.

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 between the ages of 21 and 59 who can communicate well and are willing to volunteer to fill out 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 the Arabic vernacular. The aim of this investigation was to assess women's knowledge regarding cervical cancer screening. MCQ inquiries were the sole form of inquiry that was presented. It comprised 14 inquiries, which encompassed the following: definition, risk factors, causes, signs and 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:

The responses provided in each question (multiple choice questions) were used to determine the weighting of all knowledge categories. When the response was accurate, each item was assigned a score of one, while when it was incorrect or unknowable, it was assigned

a score of zero. The total score was determined by summing the scores of all elements ***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 included queries on TPB constructs, comprising a total of 38 items. These items were categorized as follows: attitude (22 items), subjective norms (6 items), perceived behavioral control (7 items), and behavioral intention (3 items). To ensure that all of their beliefs were addressed, several sentences were incorporated into the attitude section. Additionally, certain sentences were altered to align with the morals and traditions of our Eastern society.

Scoring system:

Each item was answered on a five-point scale, with 0 representing a strongly disagree and 4 representing a strongly agree. The items were summed and the values of negative attitude items were reversed to conduct the scale scoring. (For example, a score of 0 would be assigned to a 4 when it is marked, while a score of 1 would be assigned to a 3 when it is marked. A score of 2 remains unaltered). Attitude, subjective norms, perceived behavioral control, and behavioral intention were scored on a scale of 0 to 88, 0 to 24, 0 to 28, and 0 to 12, respectively. Scores that were higher indicated that the components of attitude, subjective norms, perceived behavioral control, and behavioral intention were more advanced. ***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 employed to assess the personal behaviors or lifestyle of women. A total of 52 items makes up the HPLPII, with each item measuring a different aspect of the six theorized dimensions of a healthy lifestyle: health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations, and stress management.
- - *Health Responsibility* comes with taking charge of one's own health and happiness. When seeking professional assistance, it entails exercising informed consumerism, educating oneself about health, and paying attention to one's own health.
- - *Physical Activity* includes the consistent engagement in mild, moderate, and/or vigorous physical activity. It may occur incidentally as part of a planned and monitored program that is intended to enhance health and fitness, or as part of daily life or leisure activities.
- - *Nutrition* comprises the deliberate selection and consumption of foods that are indispensable for one's health, sustenance, and general well-being. Included in this is the selection of a daily diet that is both nutritious and in compliance with the food guide.
- - *Spiritual Growth* transcending, integrating, and developing are the methods by which the development of interior resources is accomplished. Transcending allows us to connect with our most balanced selves, allowing us to experience inner calm and explore new opportunities for personal growth by transcending our current identities and limitations. The experience of harmony, unity, and connection with the universe is known as "connecting." Developing entails the pursuit of meaning, the establishment of a sense of purpose, and the pursuit of objectives to optimize human potential for wellness.
- - *Interpersonal Relations* communication is necessary in order to cultivate a sense of intimacy and proximity in meaningful relationships with others, as opposed to more casual

ones. Communication is the exchange of thoughts and emotions through both verbal and nonverbal message exchanges.

- ***Stress Management*** to effectively control or reduce involves the identification and mobilization of psychological and physical resources.

Scoring System:

Scores for all items are as follows: Never (N) = 1, Sometimes (S) = 2, Often (O) = 3, and Routinely (R) = 4. By calculating the mean of the women's responses to all 52 items, the overall health-promoting lifestyle score is determined. Similarly, the mean of the responses to the six subscale items is determined. The total score ranged from 52 to 208, with higher scores indicating a greater level of 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:

To ensure that the tools were clear, relevant, exhaustive, and applicable, a panel of three jury experts in the field of obstetrics and gynecological nursing at Benha University evaluated the validity of the questionnaires. Minor adjustments were required in the formulation, such as the inclusion or exclusion of specific sentences. In the expert's opinion, the instruments were legitimate.

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 were 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:

Prior to the commencement of the investigation, the subsequent ethical considerations will be evaluated, Benha University's scientific research ethical committee (REC-OBSN-P35) for the nursing faculty gave their approval for this study. In the specified study contexts, official approval was given for the study to conclude. To help women feel more confident, the researchers gave them a thorough rundown of the study's goals and importance before they used the tools. The women who took part in the study assured the researchers that their information would remain private and that they would provide notarized consent. No physical, social, or psychological hazards were encountered by the women during the course of the study. The confidentiality of the women who participated was ensured by the destruction of all data collection instruments following the statistical analysis. To guarantee that human rights were upheld and that no immoral statements were included, the study instruments were implemented. Women were permitted to discontinue their studies at any moment.

Pilot study:

In an effort to evaluate the lucidity, objectivity, feasibility, and applicability of the tools and to identify any impediments or issues that could impede data collection or the researcher, five women, who constitute 10% of the total sample size, participated in the pilot study. The study's

secondary goal was to identify any obvious errors in the statements, such as those pertaining to the format or order of the questions. This also helped with the time needed to gather data estimates. To avoid contamination of the pilot sample, it was removed from the study. The experiments were then modified based on the results of the prototype.

Field work:

After the research's aims were explained to the dean of the nursing faculty, written formal sanction was obtained to conduct the research. The research was carried out from the beginning of March 2024 and completed at the end of August 2024 lasting for six months. On Mondays and Wednesdays, the researchers conducted the research at previously mentioned setting from 10:00 a.m. to 2:00 p.m. until the predetermined sample size was attained. Following the theory of planned behavior, the researchers interviewed the women in small groups (four to five women each day) in order to implement the educational program. Interviews were conducted with each group of women in their respective offices when they were available. The pamphlet (booklet) regarding cervical cancer screening was distributed to all women at the conclusion of this research, to ensure that the benefits were disseminated.

Following the five stages of the theory of planned behavior, the educational program was implemented as follows: preparatory phase, interviewing and assessment phase, planning phase, implementation phase and evaluation phase.

Preparatory phase:

Preparatory phase: The initial phase of the research, during which the researchers reviewed the local and international literature pertinent to the research problem. The researchers were able to gain a better understanding of the problem's severity and magnitude, which in turn facilitated the preparation of the necessary data collection tools. The tools were disseminated to three obstetrics and gynecological nursing experts at the Benha University faculty in order to evaluate their appropriateness, comprehensiveness, clarity, relevance, and applicability. The jury results were determined.

Interviewing and assessment phase:

Interviews with the women were conducted in their administrative offices by the researchers. The first part of the interview included the following: the researchers introduced themselves to each woman who was taking part in the study, greeted her, explained the research's purpose, gave her all the information she needed about the interventions' frequency and number of sessions, and got her signed consent to participate. The researchers utilized the initial visit to distribute ***(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 measures women's attitude on cervical cancer screening as well as their subjective norms, perceived behavioral control, and behavioral intention. Finally, the studied women were given (***Tool: III) Health-Promoting Lifestyle Profile II*** in order to assess the personal practices or way of life of women by incorporating the dimensions of a health-promoting lifestyle: stress management, social interaction, nutrition, physical activity, spiritual development, and health responsibility.

The questionnaires typically took 40 to 50 minutes to complete. The data collected during this phase was used to establish the groundwork for subsequent comparisons that were conducted to assess the educational program's efficacy in accordance with the theory of planned behavior. It is during this phase that researchers begin to ascertain the educational requirements of each woman, which is instrumental in the planning phase. Telephone numbers of women were collected to establish a WhatsApp group that would facilitate communication between and after sessions.

Planning phase:

The researchers devised an educational program that was based on the theory of planned behavior. The program was presented in the form of a printed booklet that was accompanied by colourful illustrations, as a result of the results gained during the assessment phase. The researchers created a booklet that was constructed after conducting a comprehensive and pertinent literature review. The booklet was designed to be easily comprehensible, satisfy the study women's knowledge deficit, improve their behaviors regarding cervical cancer screening, and modify their lifestyle. The booklet was produced using simple Arabic language and a variety of illustrated images. Teaching methodologies, instructional media, and session content and number are determined. The goals of the educational program were set with the theory of planned behavior in mind, and they were supposed to be accomplished when the program was over.   Ensuring that every woman could learn the necessary knowledge, enhance her behavior, and make lifestyle changes, was the main objective of the educational program based on theory of planned behavior.

Implementation phase

The researcher conducted an educational program based on the theory of planned behavior to evaluate the knowledge, behaviors, and lifestyle modifications related to cervical cancer screening. Four scheduled sessions were conducted twice a week for each group over the course of two consecutive weeks to implement this intervention. Immediately following the assessment phase, it was administered in the instructional classroom located on the third floor of the Faculty of Nursing at Benha University. Each session lasted approximately 30 to 40 minutes, contingent upon their feedback and accomplishments. At the commencement of the initial session, the intervention contents were introduced to the women. The following session commenced with a review of the previous session and the objectives of the new session. In order to accommodate the level of comprehension of women, plain Arabic language was employed. In order to facilitate women's inquiries regarding the session's contents and to rectify any misconceptions, five minutes were allocated at the conclusion of each session. Each woman was apprised of the time of her subsequent visit.
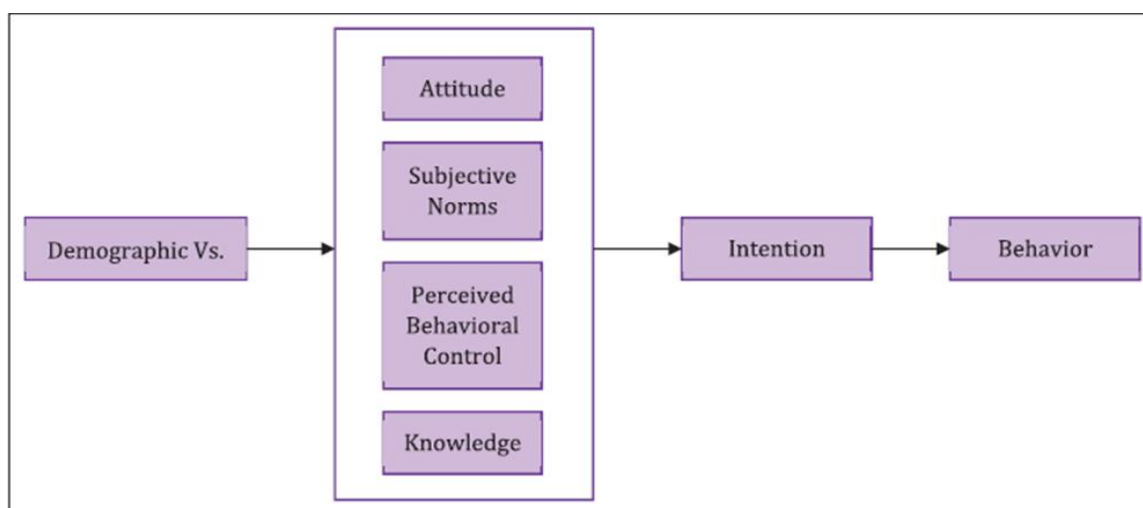

Figure (1): The conceptual framework of theory of planned behavior (TPB).

Lectures, group discussions, and problem solving, brainstorming, and critical thinking were used as a different method of teaching. To accomplish its objectives, the study implemented instructional media, including laptops, PowerPoint presentations, online and offline videos, and a vibrant booklet that was distributed to all recruited women during the initial session. Researchers also used stickers and flyers as a kind of stimulus control to help the women in their study understand the ideas behind the intervention and the impact of the educational program based on theory of planned behavior.

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

Sessions	Objectives	Summary of topics and activities
First	o 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	o 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	o 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	o Familiarity of women with perceived barriers to cervical cancer screening. o 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:
Before entering data into the computer, it was double-checked. We will use suitable statistical techniques and tests to arrange, code, computerize, and analyze the data we acquire. For this study, we consulted SPSS 22.0, the Statistical Package for the Social Sciences. Standard deviations, means, frequencies, and percentages were used to provide descriptive statistics for each variable. Pairwise t-tests and chi-square tests were among the inferential statistics used to evaluate the study's hypothesis. We calculated the correlation coefficient to look for patterns in the relationships between the scores of the different variables. If the p-value was less than 0.05, there was no statistically significant difference; however, if it was 0.001 or above, there was a very significant difference.
Results

Table (1) demonstrates that the mean age of the women studied was 40.83±8.79 years, with 40.4% of them falling within the 30-39 age group. In terms of their residence, (59.6%) of the women we studied resided in countryside. In terms level of education, it was demonstrated that secondary or technical education was obtained by (53.9%) of the women who were examined. In terms of employment, (86.5%) and (61.5%) were employee, and had insufficient monthly income, respectively. In addition, the majority of the women who were examined (96.2%) did not have a family history of cervical cancer.

Table (2) The findings demonstrated that there were highly statistically significant disparities in the knowledge of women regarding cervical cancer screening with respect to all items of the study, before and after implementation of educational program (P ≤ 0.001).

Figure (1)
demonstrates that, prior to the program's implementation, only (19.2%) of the studied women possessed a high level of knowledge regarding cervical cancer screening. Nonetheless, (75.0%) of the women who were studied possessed a high level of knowledge regarding cervical cancer screening four weeks after the program was implemented.

Table (3) The implementation of the program resulted in a highly statistically significant improvement in all constructs of the theory of planned behavior domains related to behavior attitude, subjective norms, perceived behavioral control, and behavioral intention compared to the pre-implementation period (P ≤ 0.001).

Table (4) specifies that the total mean scores of behavior attitude, subjective norms, perceived behavioral control, and behavioral intention were highly statistically significant differences before and after the program's implementation (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, the total mean score of lifestyle modification and its domains (health responsibility, physical activity, nutrition, spiritual growth, interpersonal relations, and stress management) is significantly higher than it was prior to the program's implementation (P ≤ 0.001).

Figure (3): indicates that a satisfactory level of total lifestyle modification was achieved by (38.5%) of the women who were studied prior to the implementation of the program. Nevertheless, 71.2 percent of the women who were studied reported that their lifestyle modifications were satisfactory four weeks after the program was implemented.

Table (6) illustrates that, there was a highly statistically significant positive correlation between the total knowledge score and the total scores of the lifestyle modification and TPB constructs both before and after the program was implemented (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 statistically significant $p \leq 0.0$ **A highly statistically significant $p \leq 0.001$
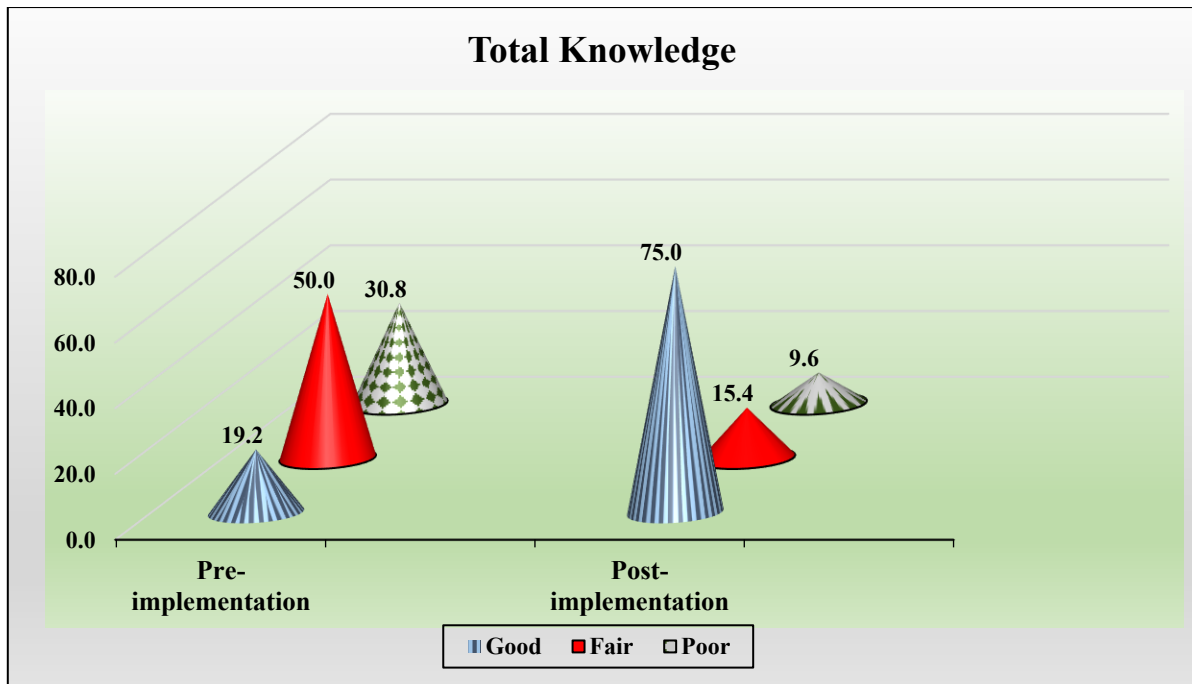
Figure (1): Percentage distribution of studied women regarding their total knowledge score regarding cervical cancer screening before and after implementation (n=52).

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 Mean ± SD	4 weeks post-implementation Mean ± SD	Paired t-test	P-value
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): 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 statistically significant p ≤ 0.0   **A Highly statistically significant p ≤ 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****

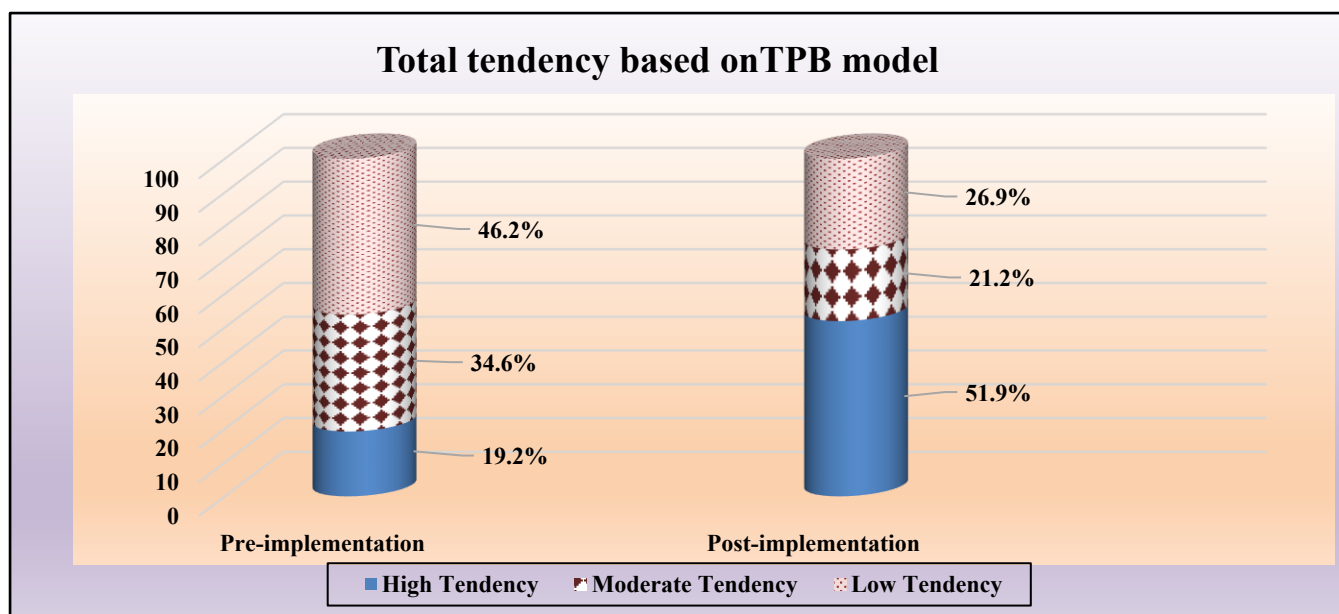*A statistically significant p ≤ 0.0   **A highly statistically significant p ≤ 0.001

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 Mean ± SD	4 weeks post-implementation Mean ± SD	Paired t-test	P-value
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****

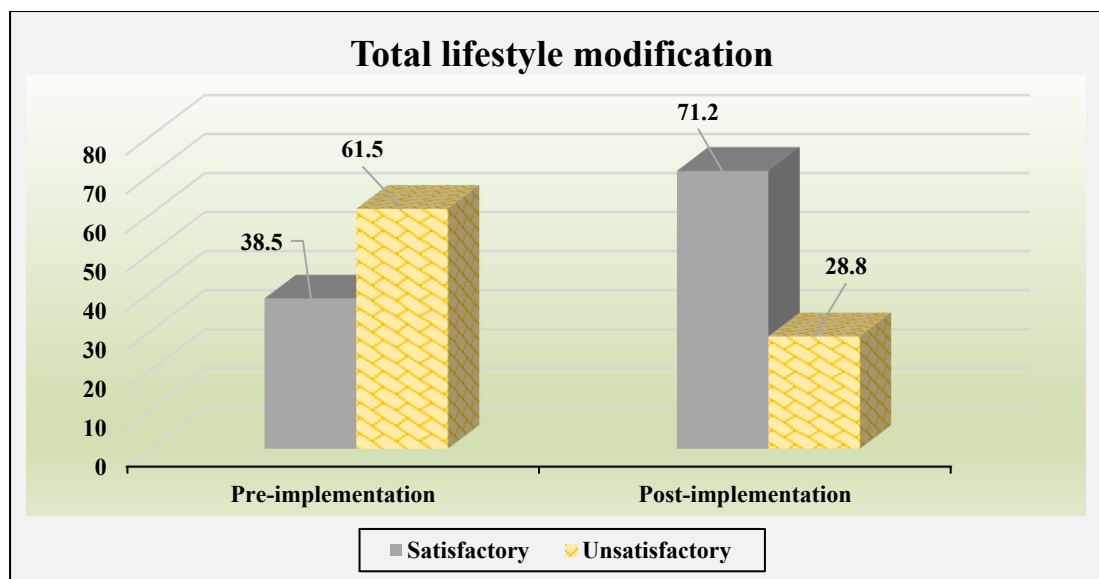*A statistically significant $p \leq 0.0$ **A highly statistically significant $p \leq 0.001$

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 statistically significant (p ≤ 0.001)

Discussion

Cervical cancer is a disease that is extremely prevalent among women and is associated with significant morbidity and mortality that is worldwide. Screening can identify precancerous lesions that can be treated, thereby eliminating the risk of developing a potentially fatal disease *(Gibson-Helm et al., 2023).* Detection of the disease at an early, curable stage in asymptomatic, seemingly healthy women is the fundamental principle of CCS *(D'Augè et al., 2023).* In order to prevent the occurrence of CC, it is essential for women to maintain a stable, healthy habits and enhance their lifestyle *(Chen et al., 2023).* It is acknowledged that the theory of planned behavior is a comprehensive and effective model for behavioral change. There is potential for sustainable behavioral changes to result from educational interventions that are based on TPB *(Ghasemian et al., 2024).* Consequently, 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 current study's findings indicated that the mean age of the studied women was 40.83±8.79 years, with over two-fifths of them falling within the 30-39 age bracket. Residentially, over half of the women who were

studied resided in countryside. It was demonstrated that over half of the women who were studied had secondary or technical education in terms of their educational background. When it comes to the majority of the women who were studied, less than two-thirds were employed and sustained an inadequate monthly income, respectively. The study also revealed that most of the women who were studied did not have a 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)* who revealed that the mean age was 44.12 ± 3.14 years. 73.2% of the participants resided in rural areas, while 72.7 percent had completed secondary education. Furthermore, I concurred with *Abdel Rahman et al., (2023)* who elaborated that the participants' ages ranged from 20 to 39, with 36.75 ± 11.17 years being the mean age. Half or more of the participants had finished secondary education, and just over two-thirds were coming from urban regions. Additionally, these results agreed with *Amin et al., (2023)* who revealed that (99.1%) did not have a family history of human papillomavirus or cervical cancer. In addition, these findings were corroborated by a study conducted in China by *Xin et al., (2023)* and elaborated that the majority (95.8%) had no family history of cervical cancer.

Knowledge about cervical cancer is a crucial because it is one of the most easily preventable forms of cancer if early screening and diagnosis are made. Poor access to preventive services, beliefs, risk factors, low awareness of CC, and the unaffordability of the service can all influence 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 ($P \leq 0.001$). The theory of planned behavior informed the educational program, which aimed to raise women's consciousness about the need to take preventative actions against cervical cancer by learning about the disease's risk factors and the benefits of screening for the disease.

These results in accordance with *Osman et al., (2023)* who shown to possess sufficient knowledge, as evidenced by a statistically significant disparity ($P < 0.001$) between the assessments administered before and after the intervention. The results also agreed with what was expected from *Yakout et al., (2022)* who portrayed a statistically significant difference was observed among the study group in pre and posttest ($P < 0.001$) according to their total score of knowledge about cervical cancer screening. Not only that, but these findings lined up with *Eghbal et al., (2020)* After the educational program's intervention, there was a significant difference between the two groups' mean scores on knowledge about cervical cancer screening (p 0.001).

In order to reduce mortality rates among women and increase early detection rates, basic education on cervical cancer screening is essential *(Yadav et al., 2024).* **Concerning studied women's total knowledge score regarding cervical cancer screening,** before the program was implemented, less than one fifth of the women who were studied possessed a high level of knowledge regarding cervical cancer screening, according to the present study. This discovery may be attributable to the absence of a well-organized CCS program in Egypt, a lack of awareness regarding CCS, and the fact that most of the studied women did not have a familial history of CC. Additionally, the current scarcity of highly qualified health care providers and

financial resources has resulted in the absence of cervical cancer screening programs at health care centers. This result was virtually identical to a study conducted in India by ***Karena and Faldu, (2024)*** and noted that just 28.8 percent of the participants who took part had thorough and adequate knowledge of cervical cancer screening. Also, this outcome agreed with ***Aziz et al., (2022)*** which revealed that about two-thirds of the women polled were unaware of the importance of cervical cancer screening. The most common obstacles that prevented women from participating in CCS were the absence of cervical cancer symptoms, anxiety about the test results, discomfort with the idea of vaginal examination, and lack of knowledge.

However, 4 weeks post-implementation of program, three-quarters of the women who were studied had good knowledge regarding cervical cancer screening. This discovery corroborated the study hypothesis, which asserted that "The studied women will exhibit improved knowledge after implementation of educational program based on theory of planned behavior than before". Possible explanations include women's natural curiosity about learning of cervical cancer screening and the use of visual aids such as PowerPoint presentations, online and offline videos, and colorfully illustrated booklets to inform and engage them throughout the program's rollout.   Additionally, the women's direct interaction and effective communication facilitate the acquisition of essential knowledge and the clarification of any matters that are obscure.

This result agreed with ***Abd El-hamed, (2023)*** who found that just 17% of Egyptian women had enough knowledge about cervical cancer screening prior to the program's implementation. This figure increased to 84.7% following the program, which indicates a statistically significant difference (P value $\leq$ 0.001). Additionally, the results are consistent with a study that was carried out in Egypt by ***Ahmed et al., (2023)*** and reported from 19.1±14.7 at the start of the intervention to 35.3±9.3 after the intervention, there was a significant increase in the mean total knowledge score (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. This outcome was further confirmed by ***Fawzy et al., (2023)*** who showed that over two-thirds of the women who participated in the study had a good level of knowledge about cervical cancer screening, which varied significantly between the areas before and after the implementation.

The theory of planned behavior is an intention model is employed to comprehend and elucidate healthy behavior by influencing attitude, subjective norms, and perceived behavioral control in order to address the issue of insufficient intention to engage in health behaviors ***(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 program implementation more than before (P $\leq$ 0.001). This provided evidence that health education has the potential to raise cervical cancer screening rates by educating women about the importance of the screening and how to get the most out of it. The attitude and willingness of women toward the disease would be indicative of a positive attitude toward increasing cervical cancer screening. High subjective norms, favourable attitudes, and greater behavioural control were the critical factors that led to an increase in intention. Consequently, it was more probable that the woman would undergo CCS measures.

These results were congruent with the study of **Sarvestani et al., (2021)** who reported that attitude, subjective norms, perceived behavioural control, and behavioural intention were all significantly reduced in the control group after an Iranian educational intervention grounded in the theory of planned behavior. Contrarily, there were statistically significant improvements in these areas for the intervention group. This difference improved the accuracy of the Pap smear tests administered to the study's women participants. In addition, after an educational program was implemented to improve women's pap-smear test performance, **Jeihooni et al. (2021)** confirmed that the experimental group's mean scores on perceived vulnerability, perceived seriousness, perceived advantages, perceived behavioural control, subjective standards, and behavioural intent increased significantly (P 0.05). In addition, these findings align with **Zandi et al., (2023)** and observed that the TPB values in the intervention group significantly improved (p < 0.05) as a result of the educational intervention, while the control group did not experience any significant changes.

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 regarding CCS may have been explained by the fact that the majority of the women studied lived in rural areas and possessed a low level of awareness, which is a consequence of cultural beliefs, religious practices, and limited access to healthcare services. This final outcome remains consistent with the research conducted in South Africa by **Gwavu et al., (2023)** who found that the women exhibited unfavourable attitudes toward Pap smear and cervical cancer screening. Consequently, it is recommended that specific interventions be implemented to enhance the adoption of cervical screening.

However, 4 weeks post-implementation of program, more than half of the women who were examined exhibited a 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". which provided the women with access to crucial resources and direction, may have had a significant impact for this reason. This program based on the TPB effectively improved the intention, resulting in a behavioural change toward CCS by altering their health attitudes and preventative actions.

These results were supported by **Shojaeizadeh et al., (2023)** and demonstrated that the primary discovery of the study was a shift in the health behaviours of the participants, as the majority of them (81.4%) pursued Pap tests for the first time, despite having never previously undergone such tests. Furthermore, the results of this study are consistent with **Fawzy et al., (2023)** who found that while 62% of the women surveyed had a positive outlook on cervical cancer screening before the program began, that number increased to 82% after the program began. In addition, these findings were in accordance with **Sarvestani et al., (2021)** and suggested that the women's performance on the Pap smear screening test was enhanced through the implementation of effective subjective norms, the provision of educational programs tailored to the women's requirements, and the implementation of appropriate planning.

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 ≤ 0.001). One way to encourage healthy habits is to make women more conscious of their own health and the factors that affect it. It is imperative to improve health literacy, as it motivates women to embrace behaviours that are more advantageous for their overall health and the prevention of cervical cancer. These findings were virtually identical to those of a study conducted in Brazil carried out by ***Di and Wang, (2023)*** following the theory of planned behaviour, the education group significantly outscored the control group on lifestyle measures including self-realization, interpersonal relationships, nutrition, physical activity, health responsibility, and stress management (P>0.05). There was consensus among the results with ***Nazari et al., (2023)*** who demonstrated that a diet and a high-quality nutrition can be beneficial for the prevention of cervical cancer and may lower the risk of developing the disease. Additionally, these findings are virtually identical to ***Ibrahim et al., (2021)*** following program implementation, there was a statistically significant difference between the two groups as measured by the health promotion lifestyle profile-II. The elements that were significantly associated (P < 0.001) among them were stress management, interpersonal interactions, spiritual growth, physical exercise, diet, and health responsibility.

Concerning studied women regarding their total lifestyle modification, According to the findings of the current study, more than one-third of the women under the study demonstrated a satisfactory level of total lifestyle modification prior to the program's implementation. This may be the result of a dearth of understanding about the significance of stress management, healthy nutrition, and adequate exercise. On the other hand, less than three-quarters of the women who were studied had achieved a satisfactory level of total lifestyle modification four weeks after the program was implemented. This result corroborated the study hypothesis, which asserted 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 caused by the fact that women's cognizance of healthy practices is increased as a result of their high level of knowledge, which in turn increases their adherence to healthy lifestyle practices such as appropriate exercise and healthy nutrition. This outcome was in accordance with ***Osman et al., (2023)*** study and noted 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, indicating a greater comprehension of the various strategies that promote a healthy lifestyle to reduce the modifiable risk of cervical cancer. In addition, these findings were in accordance with ***Ibrahim et al., (2021)*** It was found that the study group's total health promotion lifestyle profile-II improved from 20% before the program was implemented to 64.4% afterward.

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 statistically 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). This may be attributed to the fact that women are able to positively evaluate their control behaviours and develop capabilities that can compete with social norms, and they are able to build positive attitudes, accept counselling from health professionals, and implement CCS practice as a result of their increased knowledge and perceived power. Additionally, the primary responsibility for enhancing a healthy lifestyle that is associated with a higher quality of life is borne by women's positive attitudes and awareness. This result is consistent with ***Ibrahim et al., (2021)*** after the program was put into place, the women in the study group

showed a positive and statistically significant correlation (P < P 0.001) between their knowledge and their health promotion lifestyle. In addition, the results were in line with *El Sayed et al., (2020)* and illustrated a positive highly statistically significant correlation (P ≤ 0.001) was noted between the women's total knowledge scores before and after the intervention and their self-care behaviours based on planned behavioral theory.

Conclusion

Based on the results of the current research, it can be proved that; knowledge, attitude, subjective norms, perceived behavioral control, and behavioral intention, among women regarding cervical cancer screening were all significantly affected by the educational program, as per the theory of planned behavior. Evidence from this study shows that TPB is an effective strategy for lowering cervical cancer risk via lifestyle modification. In addition, both before and after the program was put into action, a very significant positive correlation (P < 0.001) was seen between the total scores of the lifestyle modification and TPB items and the overall knowledge score. 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.

References:

1. Abd El-hamed, M. A., (2023). Effect of Teaching Back Model intervention on Premenopausal Women's Knowledge, Attitude and Barriers Regarding Cervical Cancer and its Screening, International Egyptian Journal of Nursing Sciences and Research (IEJNSR), 3 (2), 524-544.
2. Abdel Rahman, R. I., Badawy, A. S., Elsebeiy, F. I., and Gouda, E. A., (2023). Awareness of Women towards Risk Factors, Screening Practices and Preventive Behaviors of Cervical Cancer, Zagazig Nursing Journal, 19(1), 118-132.
3. Ahmed, H. A., Yassin, S. Y., Ahmed, M. S., Yousof, H. Z., (2023). Application Of Health Belief Model About Cervical Cancer Screening Among Female Officer Employees In Kafr-El Sheikh University, Egypt. JPMA, the Journal of the Pakistan Medical Association, 73(4), S67-S71.
4. Ajzen, I., and Fishbein, M., (1980), Understanding Attitudes and Predicting Social Behavior. Englewood Cliffs, NJ: Prentice-Hall, Inc.

5. Al-Kandari, F and Vidal, V. L., (2007), Correlation of the health-promoting lifestyle, enrollment level, and academic performance of college of nursing students in Kuwait, Nursing & Health Sciences. 9(2), 112-119.

6. Amin, E. S., Sabry, S. S., and Abdelrahman, B., (2023). Health Belief Model for Women regarding Cervical Cancer, Journal of Nursing Science Benha University, 4(2), 287-301.

7. An, J., and Vincent, C., (2022). A Critique of the Theory of Planned Behavior in the Cancer Screening Domain. Advances in Nursing Science, 45(2), 179-193.

8. Asare, M., Obiri-Yeboah, D., Enyan, N. I. E., Nuer-Allornuvor, G., Fosu, E. S., Ken-Amoah, S., and Akakpo, P. K., (2024). An intervention to increase cervical cancer screening among women living with HIV: A mixed methods study, Patient Education and Counseling, 118, 107993.

9. Aziz, M., Mohamed, H., Mohammed, A., and AbdEl-hamed, M., (2022). Premenopausal Women's Awareness and Barriers Regarding Cervical Cancer and its Screening. Minia Scientific Nursing Journal, 012(1), 79–86. https://doi.org/10.21608/msnj.2022.161405.10 35.

10. Basoya, S., and Anjankar, A., (2022). Cervical cancer: Early detection and prevention in reproductive age group, Cureus, 14(11):e31312, DOI 10.7759/cureus.31312.

11. Bonuck, K. J., Angier, H., McCrimmon, S., Holderness, H., Erroba, J., Hugue, N., DeVoe, J. E., and Carney, P. A., (2023). A Scoping Literature Review on Evidence-Based Strategies to Increase Cervical Cancer Screening, Journal of Primary Care & Community Health, 14: 1–12

12. Chen, S. L., Nøst, T. H., Botteri, E., Ferrari, P., Braaten, T., Sandanger, T. M., and Borch, K. B., (2023). Overall lifestyle changes in adulthood are associated with cancer incidence in the Norwegian Women and Cancer Study (NOWAC)–a prospective cohort study, BMC Public Health, 23(1), 1-12.

13. Choueiry G., (2021). One-Group Pretest-Posttest Design: An Introduction. Available at: https://quantifyinghealth.com/one-group-pretest-posttest-design/ Accessed on October 10, 2023, 9 am.

14. D'Augè, T. G., Giannini, A., Bogani, G., Di Dio, C., Laganà, A. S., Di Donato, V., Salerno, M., Caserta, D., Chiantera, V., Vizza, E., Muzii, L., and D'Oria, O., (2023). Prevention, screening, treatment and follow-up of gynecological cancers: state of art and future perspectives, Clinical and Experimental Obstetrics & Gynecology, 50(8), 160.

15. Di, C., and Wang, B., (2023). Effects of a health education mode based on the theory of planned behavior on the postoperative lifestyle of patients with cervical cancer, Acta Paul Enferm. 2023; 1-8, 36:eAPE025232.

16. Eghbal, S. B., Karimy, M., Kasmaei, P., Roshan, Z. A., Valipour, R., and Attari, S. M., (2020). Evaluating the effect of an educational program on increasing cervical cancer screening behavior among rural women in Guilan, Iran. BMC women's health, 20(1), 1-9.

17. El Sayed, H., Said, S., Mohy, H., and Emam, A., (2020). Efficacy of an intervention based on theory of planned behavior on self-care management among women with pregnancy induced hypertension, J Nurs Heal Sci, 9(1), 7-20.

18. Elazab, M., Ali, O., Ramadan, M. C., Hassan, M., Aljedaani, H., and Gardner, F., (2021). The Prevalence of Human Papilloma Virus (HPV) among Egyptian Women and Its Impact: An Observational Study, Open Journal of Obstetrics and Gynecology, 11(07), 879–884.

19. Ellis, J. M., and Helaire, L. J., (2023). Self-efficacy, subjective norms, self-regulated learning: an application of the theory of planned behavior with gear up students, Education and Urban Society, 55(7), 844-875.

20. Fawzy, A. M., Hossien, D. Y. E. S., Ibrahim, D. E. M., and Taha, D. R. R., (2023). Effect of Educational Program on Knowledge and Attitudes towards Cervical Cancer Screening among Women of Reproductive Age, Minia Scientific Nursing Journal, 14(1), 2-12.

21. Ghasemian, A., Sargeran, K., Khami, M. R., and Shamshiri, A. R., (2024). Effects of educational interventions based on the theory of planned behavior on oral cancer-related knowledge and tobacco smoking in adults: a cluster randomized controlled trial, BMC cancer, 24(1), 45.

22. Gibson-Helm, M., Slater, T., MacDonald, E. J., Stevenson, K., Adcock, A., Geller, S., Parag, V., Lambert, C., Bennett, M., Hibma, M., Sykes, P., Saville, M., Hawkes, D., Stanton, J., Clueard, M., Jelley, G., and Lawton, B., (2023). Te Ara Waiora–Implementing human papillomavirus (HPV)

primary testing to prevent cervical cancer in Aotearoa New Zealand: A protocol for a non-inferiority trial, Plos one, 18(3), e0280643.

23. Gwavu, Z., Murray, D., and Okafor, U. B., (2023). Perception of Women's Knowledge of and Attitudes towards Cervical Cancer and Papanicolaou Smear Screenings: A Qualitative Study in South Africa, In Healthcare, 11(14), p. 2089, MDPI.

24. Hamdar, H., Banerjee, S., Sengupta, S., and Semenenko, E., (2023). Health technologies as innovative tools to prevent cervical cancer in low -and-middle income countries, 2023Journal of Internal Medicine and Health Affairs 2(4),1-9, DOI:10.58489/2836-2411/027.

25. Hemida, R., Hamdan, R., Hasan, M., Barakat, R., Nabil, H., Elkhiary, M., and Feyala, E., (2023). # 232 A roadmap to eliminate cervical cancer in Egypt and other low-resource settings: Mansoura initiative.

26. Ibrahim, N., El-Nafrawy, M., Ramadan, S., and Salama, A., (2021). Effect of application of health promotion model on lifestyle of women with endometriosis, Journal of Nursing Science Benha University, 2(2), 154-169.

27. Ismail, R. M., Gaballah, A., Salama, A. H., Shakweer, M. M., Meckawy, G. R., and Faisal, M. M., (2023). Prognostic Impact of Human Papilloma Virus Infection on Cervical Cancer Patients Reflected by p16ink4a Expression: Single Institution Experience, Asian Pacific Journal of Cancer Biology, 8(2), 119-125.

28. Jeihooni, A. K., Moayedi, Z. S., Momenabadi, V., Ghalegolab, F., and Harsini, P. A., (2023). Effect of Educational Intervention Based on Theory of Planned Behavior (TPB) on Doing Breast Self-examination in a Sample of Iranian Women, SAGE, Breast Cancer: Basic and Clinical Research, 17: 1–11.

29. Jeihooni, A., Jormand, H., and Harsini, P. A., (2021). The effect of educational program based on beliefs, subjective norms and perceived behavior control on doing pap-smear test in sample of Iranian women. BMC women's health, 21, 1-10.

30. Karena, Z. V., and Faldu, P. S., (2024). A Cross-Sectional Study on Knowledge, Attitude, and Practices Related to Cervical Cancer Screening Among the Nursing Staff in a Tertiary Care Hospital in the Western Region of India, Cureus, and 16(1), 1-9.

31. Koca, B. R., and Açıkgöz, A. A., (2023). Cervical cancer risk levels among women aged 30-65 and factors affecting compliance with the national cervical cancer screening standards, Medicine Science, 12(1), 108-114.

32. Komal S, Govardhan1 M, Ajay G, Kapil M and Somya G., (2023). Knowledge, attitude, and practice about cervical cancer among adult women in rural Jaipur: An observational analysis, Journal of Family Medicine and Primary Care 12(10):2379-2384|DOI: 10.4103/jfmpc.jfmpc_933_23

33. Mongsawaeng C, Kokorn N, Kujapun J, Norkaew J, Kootanavanichpong N, Chavenkun W, Ponphimai S, Kaewpitoon SJ, Tongtawee T, Padchasuwan N, Pengsaa P, Kompor P and Kaewpitoon N., (2016). Knowledge, attitude, and practice regarding cervical cancer among rural community women in Northeast Thailand. Asian Pac J Cancer Prev, 17, 85-8.

34. Nazari, E., Hasanzadeh, M., Rezvani, R., Rejali, M., Badpeyma, M., Delaram, Z., Mousavi-Seresht, L., Akbari, M., Khazaei, M., Ferns, G., and Avan, A., (2023). Association of dietary intake and cervical cancer: a prevention strategy, Infectious Agents and Cancer, 18(1), 42.

35. Nothacker, J., Nury, E., Mathieu, M. R., Raatz, H., Meerpohl, J. J., and Schmucker, C., (2022). Women's attitudes towards a human papillomavirus-based cervical cancer screening strategy: a systematic review, BMJ Sexual & Reproductive Health, 48(4), 295-306.

36. Nwachukwu, C., Asuzu, N. E., Innocent, D. C., Emerole, C. O., Ekeleme, U. G., Dozie, U. W., Ekenze, J., Innocent, R., Dike, I., Iwuagwau, U., Akpevba, E., Rabaan, A., and Innocent, I. P., (2023). Knowledge and Utilization of Cervical Cancer Screening Services Among Female Undergraduates at FUTO. Journal ISSN, 2766, 2276.

37. Omoyeni, O. M., and Tsoka-Gwegweni, J. M., (2022). Prevalence of cervical abnormalities among rural women in KwaZulu-Natal, South Africa. Pan African Medical Journal, 41(1), 1-12.

38. Osman, B. M., Abd Elkodoos, R. F., Reda, D. M., Soliman, H. A., and Aboushady, R. M. N., (2023). Effect of Educational program based on the Prevention Model on Women Knowledge Regarding Cervical Cancer Prevention, Egyptian Journal of Health Care, 14(2), 1011-1027.

39. Perkins, R. B., Wentzensen, N., Guido, R. S., and Schiffman, M., (2023). Cervical cancer screening: a review, Jama, 330(6), 547-558.

40. Riano, I., Contreras-Chavez, P., Pabon, C. M., Meza, K., Kiel, L., Bejarano, S., and Florez, N., (2024). An Overview of Cervical Cancer Prevention and Control in Latin America and the Caribbean Countries, Hematology/Oncology Clinics of North America, 38(1), 13-33.

41. Riggi, E., Baccini, M., Camussi, E., Gallo, F., Anatrone, C., Pezzana, A., Senore, C., Giordano, L., and Segnan, N., (2022). Promoting healthy lifestyle habits among participants in cancer screening programs: results of the randomized controlled Sti Vi study, Journal of Public Health Research, 11(3), 22799036221106542.

42. Sarvestani, M., Khani Jeihooni, A., Moradi, Z., and Dehghan, A., (2021). Evaluating the effect of an educational program on increasing cervical cancer screening behavior among women in Fasa, Iran, BMC Women's Health, 21(1), 1-8.

43. Sedrak A. S, Galal Y. S and Amin, T. T., (2016). Cancer Screening Knowledge and Attitudes of Under- and Post-Graduate Students at Kasr Al Ainy School of Medicine, Cairo University, Egypt. Asian Pacific Journal of Cancer Prevention, 17(8):3809-3816

44. Shojaeizadeh, D., Hashemi, S. Z., Moeini, B., and Poorolajal, J., (2023). The effect of educational program on increasing cervical cancer screening behavior among women in Hamadan, Iran: Applying health belief model, Journal of research in health sciences, 11(1), 20-25.

45. Tadesse A, Tafa Segni M and Demissie, H. F., (2022). Knowledge, Attitude, and Practice (KAP) toward Cervical Cancer Screening among Adama Science and Technology University Female Students, Ethiopia. Int J Breast Cancer; 2490327. doi: 10.1155/2022/2490327. PMID: 35070454; PMCID: PMC8776479.

46. Tyerman, J., Cobbett, S., Harding, M., Kwong, J., Roberts, D., Hagler, D., Reinisch, C., (2022). nursing management: female reproductive conditions, In Lewis's Medical-Surgical Nursing in Canada - E-Book, Elsevier Health Sciences, Chapter 56, p 1395.

47. Uniyal, P., (2022). Cervical cancer: 6 lifestyle changes to prevent the disease, Hindustan Times, available at https://www.hindustantimes.com/lifestyle/health/cervical-cancer-6-lifestyle-changes-to-prevent-the-disease-101642933072392.html, accessed on 12/12/2023.

48. Walker, S. N, and Hill-Polerecky, D. M., (1996). Psychometric evaluation of the Health-PromotingLifestyle Profile II. Unpublished manuscript, University of Nebraska Medical Center.

49. Wilding, S., O'Connor, D., and Conner, M., (2023). Social Norms in Cervical Cancer Screening, Psychological Reports, 0(0) 1–17.

50. World Health Organization, (2022). Accelerating the elimination of cervical cancer as a public health problem: Towards achieving 90–70–90 targets by 2030 (No. SEA/RC75/12). World Health Organization. Regional Office for South-East Asia.

51. World Health Organization, (2023). Cervical cancer, available at https://www.who.int/news-room/fact-sheets/detail/cervical-cancer, accessed on 28-12-2023.

52. Xin, T., Jiang, Y., Li, C., Ding, X., Zhu, Z., and Chen, X., (2023). Using planned behavior theory to understand cervical cancer screening intentions in Chinese women, Frontiers in Public Health, 11, 1063694, 1-8. doi: 10.3389/fpubh.2023.1063694

53. Yadav, J., Kaushik, S., and Kumari, N., (2024). Factors influencing cervical cancer screening among reproductive age group women in India: A multilevel analysis of nationwide survey 2019–2021, Global Transitions, 6, 19-27.

54. Yakout, S. M., Ahmed, A., and Tosson, M. M., (2022). Health Belief Model-based educational program about cervical cancer prevention on women knowledge and beliefs. Assiut Scientific Nursing Journal, 0(0), 0–0. https:// doi.org/ 10.21608/ asnj. 2022. 127397. 1343.

55. Zandi, N., Behboodi Moghadam, Z., Hossein Rashidi, B., Namazi, M., and Haghani, S., (2023). Reproductive health of women with endometriosis: an improving educational intervention based on the planned behavior theory, Middle East Fertility Society Journal, 28(1), 1-7.

الملخص العربى

مقدمة: يُشكّل سرطان عنق الرحم خطرًا جسيمًا على حياة السيدات. يُعدّ تعديل نمط الحياة، بالتزامن مع فحص سرطان عنق الرحم، أمرًا لا غنى عنه للكشف المبكر عن سرطان عنق الرحم والوقاية منه. وتُعدّ نظرية السلوك المُخطط إطارًا يُطبّق بشكل متكرر لتوقع السلوكيات الصحية وفهمها.

الهدف: تقييم أثر برنامج تعليمي قائم على نظرية السلوك المخطط على فحص سرطان عنق الرحم وتعديل نمط الحياة لدى السيدات.

التصميم: استُخدم تصميم بحث شبه تجريبي (مجموعة واحدة، "اختبار قبلي وبعدي") لتحقيق هدف البحث.

النتائج: بعد تطبيق البرنامج التعليمي القائم على نظرية السلوك المخطط، اختلف مستوى المعلومات، ومفاهيم نظرية السلوك المخطط، وتعديل نمط الحياة بشكل عام وملحوظ لدى السيدات. وُجدت فروق ذات دلالة إحصائية. ارتبط إجمالي درجات المعلومات ارتباطًا إيجابيًا بإجمالي درجات المواقف، وتعديل نمط الحياة، ومفاهيم نظرية السلوك المخطط قبل وبعد تطبيق البرنامج، وكان هذا الارتباط ذا دلالة إحصائية عالية..

الخلاصة والتوصيات: تأثرت المعلومات، والمواقف، والمعايير الذاتية، والتحكم السلوكي المُدرَك، والنية السلوكية لدى السيدات فيما يتعلق بفحص سرطان عنق الرحم بشكل كبير بالبرنامج التعليمي، وفقًا لنظرية السلوك المُخطط. وتُظهر الأدلة من هذه الدراسة أن السلوك المُخطط استراتيجية فعّالة لخفض خطر الإصابة بسرطان عنق الرحم من خلال تعديل نمط الحياة. ومن هنا يُمكن دمج نظرية السلوك المُخطط كنموذج فعال لتعزيز الصحة في مجال فحص سرطان عنق الرحم والوقاية منه.