Effect of Educational Program Based on Health Beliefs Model on Prevention of Urinary Tract Infections among Pregnant Women

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Abstract

Background: One of the most prevalent bacterial infections during pregnancy is urinary tract infection. Urinary stasis is caused by a number of physiological and anatomical changes that take place during pregnancy. the health beliefs can play an important role in behavior change which contribute to improve health status and creating awareness for pregnant women about urine tract infection turn out to be an urgent need to prevent its complications **The aim of this study:** Was to evaluate the effect of educational program based on health beliefs model on prevention of urinary tract infections among pregnant women. **Research Design:** A quasi-experimental study with a two-group pre/posttest was used for the research. **Sample:** Purposive sampling was applied to recruit 140 pregnant women **setting:** Conducted at Obstetrics and Gynecological Outpatient Clinic in Benha University Hospital. They were divided into a study group (70) and control group (70). **Tools:** Three types of tools had been used. **Tool I:** A self-administered questionnaire. **Tool II:** Pregnant women's self-reported health practices assessment sheet. **Tool III:** Health belief model scale. **Results:** After intervention the mean scores of knowledge, practices and health beliefs of the study group displayed a significant increase compared to the control group (p= <0.001). Regarding to health belief model scale there is no statistically significant difference in the total mean score of women's health belief toward urinary tract infection between the two groups before intervention (P>0.05). However, at post-intervention and follow up phases, the total mean score of health belief in the study group were significantly higher than the score in the control group (P≤001). **Conclusions:** The implementation of educational program based on health beliefs model was effective in improving knowledge, self-reported health practices and health beliefs regarding prevention of urinary tract infections among pregnant women in the study group. **Recommendations:** Guidelines about preventive measures of urinary tract infection for pregnant women based on health belief model should be providing during antenatal care follow -up.

Keywords: Health belief model, Pregnancy, Prevention, Urinary tract infections.

Introduction

About 20% of pregnancies are caused by Urinary Tract Infections (UTIs), making them the most common pregnancy-related illnesses. They are regarded as the most prevalent pregnant illness, behind anemia. Additionally, 10% of all hospitalizations during pregnancy are attributable to them. Urinary tract infections include a variety of illnesses caused by microbiological infiltration into the normally sterile urinary system. Pregnant women are more susceptible to urinary tract infections due to immunologic changes and urinary tract alterations. Progesterone-related smooth muscle relaxation and ureteral compression from the gravid uterus cause physiologic alterations in the urinary system, such as dilatation of the ureter and renal

calyces **(Lowdermilk et al., 2020).** Anatomically, UTIs are divided into two main categories: pyelonephritis, which occurs when the UTI affects the upper urinary system, and cystitis, which is limited to the lower tract and includes silent bacteriuria. Asymptomatic Bacteriuria (ASB) is characterized by the presence of significant **(Friel, 2022).**

Frequency, urgency, dysuria, hematuria, and pain in the suprapubic region are not signs of bacteriuria. It affects between 2% and 10% of pregnant women and non-pregnant. In contrast to the general population, pregnant women should be checked for and treated with ASB. Up to 40% of pregnant women with ASB may develop pyelonephritis if treatment is not received **(Habak et al., 2024).**

Pregnancy-related UTIs are most commonly caused by asymptomatic bacteriuria. More than 100,000 organisms/ml on a clean catch urinalysis taken from a patient who is asymptomatic is known as ASB. Untreated asymptomatic bacteriuria during pregnancy increases the risk of subsequent UTI by around 25%. It is advised that all expectant mothers be checked for ASB during the initial prenatal appointment because of the high incidence and possible severity of pyelonephritis. When ASB is treated, the clinical infection rate drops to 3% to 4% **(Khatri & Burrows, 2021).**

In addition to poor maternal and perinatal outcomes such intrauterine growth restriction, pre-eclampsia, cesarean birth, and premature delivery, women with UTIs might have major obstetric problems. Thus, early UTI detection and appropriate treatment, and preventive approach are very important measures to prevent complications during pregnancy **(Sheffield et al., 2020).**

Urinary tract infections, ranging from asymptomatic bacteriuria to pyelonephritis, are linked to detrimental outcomes for both the mother and the infant. Asymptomatic bacteriuria, cystitis, and pyelonephritis can cause serious complications. Low birth weight babies, premature delivery, and Intrauterine Growth Retardation (IUGR) have all been linked to asymptomatic bacteriuria. A large retrospective analysis of over 200,000 newborns found a correlation between cystitis and cesarean delivery, premature delivery, and preeclampsia. Additionally, there is a higher chance of pregnancy problems such Acute Respiratory Distress Syndrome (ARDS), anemia, renal failure, Premature Rupture Of Membranes (PROM), and septic shock when a woman has acute pyelonephritis **(Rezavand et al., 2019).**

The first line of treatment and prevention for women who are prone to recurrent UTIs is non-pharmacologic therapy, which includes dietary, hygiene, and activity/exercise changes. This option is recommended as the possibility that an antibiotic can harm the mother and/or her fetus must be taken into consideration when prescribing it during pregnancy. In addition, prolonged antibiotic prophylactics or exposure too many rounds of antibiotics can quickly result in infections with multi-resistant organisms, making antibiotic selection challenging **(Edmunds et al., 2020).**

When it comes to nursing diagnosis and infection prevention, nurses are crucial. Nurses have received training on how to spot UTI symptoms and determine whether a woman is infected. The nurse's important involvement in UTI prevention is accomplished through continuing education programs that alter pregnant women's perceptions and understanding of UTIs in an effort to stop future recurrences. A thorough

understanding of the illness and how it manifests increases the likelihood that a UTI will be diagnosed by a nurse and those patients will be educated to detect infection early **(Kousgaard et al., 2022).**

One of the earliest theories developed specifically for behaviors connected to health is the Health Belief Model (HBM). The cognitive model is most commonly used in research on health behavior and compliance. The HBM was developed in the 1950s by a group of social psychologists to look at the causes of low involvement in illness prevention and detection programs **(Alyafei et al., 2024).** A crucial and precise pattern used to ascertain the relationship between health beliefs and behavior is the Health Belief Model. As a result, HBM may be quite helpful in creating suitable intervention strategies. HBM is a frequently used model in nursing, especially when discussing patient compliance and preventative healthcare measures **(Sharma, 2020).**

Significance of the Study

One of the most prevalent bacterial infections during pregnancy is urinary tract infection. Urinary stasis is caused by a number of physiological and anatomical changes that take place during pregnancy. Pregnant women generally had a 2-10% chance of getting a UTI **(Baker et al., 2020).**

UTIs are the most frequent causes of seeking medical treatment when symptoms worsen, according to the clinical experience. May cause severe side effects during pregnancy, such as the onset of acute pyelonephritis. Preterm labor, intrauterine growth restriction, early rupture of membranes, septicemia, anemia, temporary renal impairment, and preeclampsia are among the serious hazards associated with acute pyelonephritis during pregnancy **(Matuszkiewiczka et al., 2019).** Therefore, this study will be conducted to investigate the effect of educational program based on health beliefs model on prevention of urinary tract infections among pregnant women.

Aim of the study

The aim of the present study is to evaluate the effect of educational program based on health beliefs model on prevention of urinary tract infections among pregnant women. The aim will achieve through following hypotheses.

Research Hypotheses:

HI: Pregnant women who will receive educational program based on health belief model will exhibit higher knowledge score regarding urinary tract infection than who don't

H2: Pregnant women who will receive educational program based on health belief model will report higher satisfactory self-reported health practices regarding prevention of urine tract infection than who don't

H3: Pregnant women who will receive educational program based on health belief model will have a lower susbitabilty of getting urinary tract infection than those who don't.

Subjects and method

Research design:

A quasi-experimental study (two group pre/posttest design).

Study Settings:

The Benha University Hospitals' Obstetrics and Gynecology Outpatient Clinic served as the study's siting. With a significant volume of women from entire Qalubia Governorate and other nearby governorates, it is a large hospital in Benha City. This clinic, which consists of a single room separated into a diagnostic and examination space, is situated on the ground floor of the outpatient building. Except on Fridays and public holidays, the outpatient clinic's hours of operation are 9 a.m. to 1 p.m. Regardless of socioeconomic status, women who visited the

clinic received obstetric and gynecological care. Prenatal care, high-risk pregnancy care, birth care, family planning, and counseling are all included in this.

Sample size: The present study enrolled 140 pregnant women. The women were randomly assigned to two equal groups, and the sample size was calculated using 10% of the total population's flow rate of pregnant women as reported by the Benha University Hospital data center in 2022 (1400 pregnant women). Seventy women in the study group received regular hospital treatment along with an educational program based on the health beliefs model, while seventy women in the control group received normal hospital care alone. The sample was chosen based on the inclusion criteria listed below:

Inclusion criteria:

- Pregnant women in the first trimester
- Free from any medical or obstetrical complication
-Read and write.

Exclusion criteria:

- Women need to be hospitalized.
-Women have known underlying renal pathology, chronic renal disease, and renal transplant.
-Women under immunosuppressant therapy

Tools of data collection:

Three main tools were employed to collect data

Tool I: A self-administered questionnaire: It was designed by the researchers after reviewing related literatures **(Santiano et al., 2018; Totch, 2019),** under the guidance of supervisors and written in simple Arabic language. It consisted of three parts:

Part (1): General characteristics of studied pregnant women (5 items) as (age, residence, education, job, and income).

Part (2): pregnant woman's obstetric history (5 items) as (gravidity, parity, gestational age, abortion and mode of delivery)

Part (3): Assessment of pregnant women's knowledge regarding prevention of urinary tract infection (9 items**)** included **(**definition of UTI, signs and symptoms of UTI, diagnosis, self-management, risk factors of UTI) it covered by 9 questions

Scoring system: Regarding knowledge items, the correct answers scored "one", incorrect and don't know answers scored "zero" These scores were transformed into percent score.

The score was calculated as the following**:**

-An adequate knowledge: ≥60% of total score (6-9score)

-Inadequate knowledge: <60% of total score (1-5score).

Tool II: Pregnant women's self-reported health practices assessment sheet. It was constructed by the researchers in Arabic language after reviewing the related literatures **(Abu Aleinein, 2023; Johnson, 2021; and Alshahrani, 2021),** to assess pregnant women's health practices regarding prevention of urinary tract infection during pregnancy it was covered health practices related to four domains: nutritional practices, (8 items) personnel hygienic practices, (12 items) physical activity practices (4 items) and sexual activity and hygienic behaviors (6 items). covered by 30 questions.

Scoring system:

For each item a Likert scale of three points was used, as (0) for never done, (1) for sometimes do and (2) for always done. The higher scores reflect higher healthy practices of women. **The total practices score was calculated as the following:**

-Satisfactory practices: ≥60% of total healthy practices score (36-60 score).

-Unsatisfactory practices: <60% of total healthy practices score (1-36 score).

Tool III: Health Belief Model scale (HBM scale): This tool was adopted from **(Tehrani et al., 2020).** Modifications were done by the researchers on Arabic language. This tool was included six constructs. Perceived susceptibility to UTIs, Perceived severity of UTIs, perceived barriers of performing UTIs prevention, perceived benefits of UTIs prevention, cues to action and self-efficacy (pre and post-test).

It included three-point Likert scale anchored at 1= agree, 2= maybe and 3=don't agree. The scale consisted of 36 questions and 6sub-scales including perceived susceptibility (4 items), perceived severity (7 items), perceived barriers (5items), and perceived benefits (7 items), self-efficacy (6items), cues to action (7 items). The positive response scored "one", and the negative response scored "zero". The total behavior score was calculated by adding the scores for the positive one. This section was used as (pre/post) test.

Tool validity:

Three jurors with backgrounds in obstetrics and gynecological nursing from Benha University examined the data collecting tools to make sure they were legitimate in terms of thoroughness, correctness, and relevance. Changes were made in response to insightful feedback, including removing a few ambiguous words. For instance, rearranging certain questions and using diagnostic techniques rather than diagnosis.

Tool reliability: was done by cronbach‟s alpha coefficient test which revealed that each item of the utilized tools consisted relatively homogenous items. The internal consistency of knowledge was 0.89; the total HBM construct was 0.92, and health practices regarding UTIs were 0.75.

Ethical consideration:

Prior to beginning the study, the following ethical considerations were taken into account: - The study was approved by the Benha University faculty of nursing's scientific research ethical committee (**REC-OBSN-P83).** The chosen research sites formally

granted permission for the study to be conducted. Before using the tools, the researchers gave a brief explanation of the study's purpose and significance in order to win the trust and confidence of the women. Women gave their agreement to participate in the study, and confidentiality was guaranteed. There were no dangers to the women's physical, social, or mental health during the trial. The women might leave the research at any moment. And the study's confidentiality was preserved. At the end of the program the control group were given educational booklet and were asked to follow for any question

Pilot study:

Ten percent of the sample (14 women) participated in the pilot study, and was excluded from total number of study sample, which was carried out to evaluate the tools' objectivity, clarity, practicality, relevance, and application as well as to identify any potential issues or obstacles that could arise for the researchers and impede data collection. The pilot study's findings led to the addition, modification, omission, and correction of several things. It also aided in figuring out how long interviews would take and assessing if the locations were appropriate for conducting the interviews.

Preparatory phase:

The study's initial step was an examination of relevant local, historical, and international literature. Moreover, theoretical comprehension of several study aspects through the creation of data collection tools via books, papers, journals, magazines, and

the internet. To assess the tools' suitability, comprehensiveness, and simplicity significance, and application, three obstetrics and gynecological nursing professionals from Benha University's faculty were given access to them. The jury's verdict was rendered.

Administrative design:

Before beginning data collection, the researchers interviewed each study participant and obtained their oral informed consent after receiving formal approval to conduct the study from the Dean of the Faculty of Nursing to the Director of Benha University Hospital. This approval covered the study's purpose, participants, and duration.

Field work:

A health education program based on the health belief model was created following the evaluation and analysis of the pilot data. 140 pregnant women in all were chosen from the previously specified research settings, and after being informed of the study's goal, a formal letter was drafted and submitted to the director of Benha University Hospital to request their consent to perform the study. The study was conducted in four stages: planning, execution, assessment, and evaluation. At the conclusion of this study, the handout (booklet) about preventing urinary tract infections based on the health belief model during pregnancy was left in the outpatient clinic to be given to all women, so the benefit is spread. These phases were conducted from the beginning of April 2023 to the end of September 2023, covering a period of six months. The researchers visited the previously mentioned setting three days a week (Sunday, Monday, and Wednesday) from 9:00 am to 1:00 pm. To fulfill the aim of this research, the following phases were adopted; preparatory phase, interviewing and assessment phase, planning phase, implementation phase and evaluation phase**.**

Interviewing and assessment phase:

The researchers welcomed the woman, introduced herself, described the study's goal, and gave her all the information she needed to know about it before the interview started. The researchers then disseminated the self-administered questionnaire (**tool I**) to evaluate women's general characteristics, obstetric history, and knowledge of urinary tract infection prevention after receiving official authority to carry out the study. To evaluate women's health practices with reference to urinary tract infections, a self-reported health practices assessment sheet **(tool II**) was given out.

Health beliefs model scale (**tool III)** was used to assess women's beliefs regarding urinary tract infection. Pretest results were gathered and utilized as a baseline for subsequent comparisons to assess the impact of an educational program based on the health beliefs model on pregnant women's prevention of UTIs. Each woman interview took an average of 10 to 15 minutes to complete. The number of women questioned every week varied between three and five. For every woman, this procedure was repeated until the predetermined duration was completed within total period six months.

Planning phase: Based on information gathered during the assessment phase, the researchers created an educational booklet with a vibrant picture in Arabic to help pregnant women who were lacking in knowledge and health behaviors related to preventing UTIs during pregnancy. The booklet included both theoretical and practical components and was based on the health belief model. Additionally, both the pregnant women and the researchers decided on the time and scheduling of the sessions. A variety of instructional techniques and resources were found. After completing supportive

instructional instructions, the objectives were designed to be achieved. The overall goal was for each woman to have gained sufficient self-care skills and fundamental information about preventing urinary tract infections by the completion of the supporting instructional guidelines sessions, which had a favorable impact on their behaviors.

Implementation phase: The standard individual prenatal care was given to the control group. There was no formal schooling strategy in place. Pregnant women who got the program based on HBM made up the study group, which was evenly split up into-subgroups.

The instructional seminars on preventing urinary tract infections were attended by each category. Feedback, of the previous session, and an introduction to the goals of the subsequent session started in the educational sessions.

Four scheduled sessions were used to implement this intervention; they were held in the waiting room of the outpatient clinic at Benha University Hospital as soon as the assessment phase was finished. Each session lasted approximately 30 to 45 minutes, depending on the women's understanding level, and feedback was given in simple Arabic. Five minutes were allowed at the end of each session to allow women to ask questions in order to clear up any confusion and clarify the session's contents. Educational intervention, an educational booklet was given to these participants. The educational booklet about UTI and preventive behaviors was as a cue to action for the samples.

Evaluation phase:

Three months following the end of the instructional session, the evaluation phase began. The researchers employed the identical set of instruments for both groups: tool I part 2 evaluated women's knowledge of UTIs, while tool Il evaluated health habits related to UTIs. Tool Ill is used to evaluate women's perceptions regarding UTIs infection. Urine analysis was requested of the women in both groups in order to assess the impact of the educational program on prevention of UTI, this achieved by evaluation of studied sample regarding diagnosis of urinary tract infection included two items, first item indicated that participated women diagnosed with UTI (yes or no), second item included if confirmed UTI diagnosis in which symptoms women suffered from (burning sensation during urination, pelvic abdominal pain, and polyuria). The follow-up care was occurred in outpatient clinic during antenatal care visit and remembers pregnant women about time of follow up through telephone contact to evaluate the effect of HBM model.

Data analysis:

Collected data were arranged, and analyzed by employing Statistical Package for the Social Sciences (SPSS) program version 25. Pregnant women who are uninfected with urinary tract infection were considered as control group. Descriptive statistics was expressed using mean, median and frequency. Chi–square test (X2) and were used were used to find the significant difference for qualitative variables of different groups. The differences are considered significant when P value is equal to or less than (0.05). Qualitative variables were compared by the significance test. The correlation coefficient (r) was used to determine the relationship between the studied variables. Independent and paired t test were used to assess change pre and post intervention.

Results:

Table (1): Clarified that (51.4%) of the study group and (50.0%) of the control group in age group from (25 - <35 years old) with a mean age of 28.44±5.86 and 27.46±5.71 years old respectively. Moreover, (52.9% and 62.9%) of both study and control groups respectively

lived in rural area. Concerning level of education, it was cleared that (55.7% and 64.3%) of both study and control groups respectively had secondary education. As regards occupational status, (60.0%% and 64.3%) of both study and control groups respectively were housewives. Finally, (65.7%) and (70.0%) of both study and control groups respectively didn't have enough monthly income. Generally, there was no statistically significant difference between study and control groups regarding personal characteristics ($p>0.05$). That is the two groups under study homogenous.

Table (2): Displayed that (81.4%) and (74.3%) of both study and control groups respectively had gestational age between 10-12 weeks with a mean gestational age of 9.93±1.15 and 10.19±1.43 week respectively. Increasingly, (50.0%) of the study group and (55.7%) of both study and control group respectively were primi-gravida. Also, (52.8% and 57.2%) of both study and control groups respectively were nulliparous. Moreover, out of primi-para and multipara women, the mode of last delivery of (76.7% and 63.3%) of both study and control groups respectively was CS. Generally, there was no statistically significant difference between study and control groups regarding obstetric history ($p>0.05$). That is the two groups under study homogenous.

Figure (1): Displays that, (40.0%) of study group and (38.6%) of control group had adequate knowledge regarding urinary tract infection at pre-intervention phase. Meanwhile, at post-intervention phase, (75.7%) and (41.4%) of both the study and control groups respectively had adequate knowledge.

Figure (2): Displayed that, (34.3%) of study group and (32.9%) of control group had satisfactory self-reported health practices regarding urinary tract infection at pre-intervention phase. Meanwhile, at post-intervention phase, (71.4%) and (35.7%) of both the study and control groups respectively had adequate satisfactory self-reported health practices.

Figure (3): Displays that, (28.6%) of study group and (27.1 %) of control group had positive health belief score toward urinary tract infection at pre-intervention phase. Meanwhile, at post-intervention phase, (67.1%) and (30.0%) of both the study and control groups respectively had positive health belief.

Table (3): Demonstrates that; there was a highly significant statistical positive correlation between knowledge score and total scores of (self-reported health practices and health belief) in both groups at pre- and post-intervention phases ($P\leq 0.001$).

Table (4): Demonstrates that; there was a highly significant statistical positive correlation between total health belief score and total self-reported health practices score in both groups at pre- and post-intervention phases ($P\leq 0.001$).

Table (1): Distribution of study and control group according to their general characteristics (n= 140)

General characteristics	Control group (n=70)		Study group (n=70)		X^2/FET	P- value
	No	%	No	%		
Age (in years)					0.728	0.695
<25	23	32.9	19	27.2		
25 - <35	35	50.0	36	51.4		
≥35	12	17.1	15	21.4		
Mean ±SD	27.46±5.71		28.44±5.86		Independent t=1.008	0.315
Residence:					1.43	0.231
Rural	44	62.9	37	52.9		
Urban	26	37.1	33	47.1		
Level of education:					2.56	0.464
Read and write	6	8.6	11	15.7		
Primary education	7	10.0	5	7.1		
Secondary education	45	64.3	39	55.7		
University education	12	17.1	15	21.5		
Occupation:					0.273	0.601
Employee	25	35.7	28	40.0		
Housewife	45	64.3	42	60.0		
Monthly income:					0.295	0.587
Enough	21	30.0	24	34.3		
Not enough	49	70.0	46	65.7		

Table (2): Distribution of study and control sample according to their obstetric history (n= 140)

Obstetric history	Control group (n=70)		Study group (n=70)		X^2/FET	P value
	No	%	No	%		
Gestational age in weeks:					1.25	0.534
6-7 weeks	4	5.7	2	2.9		
8-9 weeks	14	20.0	11	15.7		
10-12 weeks	52	74.3	57	81.4		
Mean ±SD	10.19±1.43		9.93±1.15		t=1.16	0.246
Gravida:					0.459	0.498
Primigravida	39	55.7	35	50.0		
Multigravida	31	44.3	35	50.0		
Parity:					1.40	0.496
Nulliparous	40	57.2	37	52.8		
Primipara	8	11.4	13	18.6		
Multipara	22	31.4	20	28.6		
Mode of last delivery:	**(n=30)**		**(n=33)**		0.286	0.593
Normal vaginal delivery	11	36.7	10	30.3		
Cesarean section	19	63.3	23	76.7		

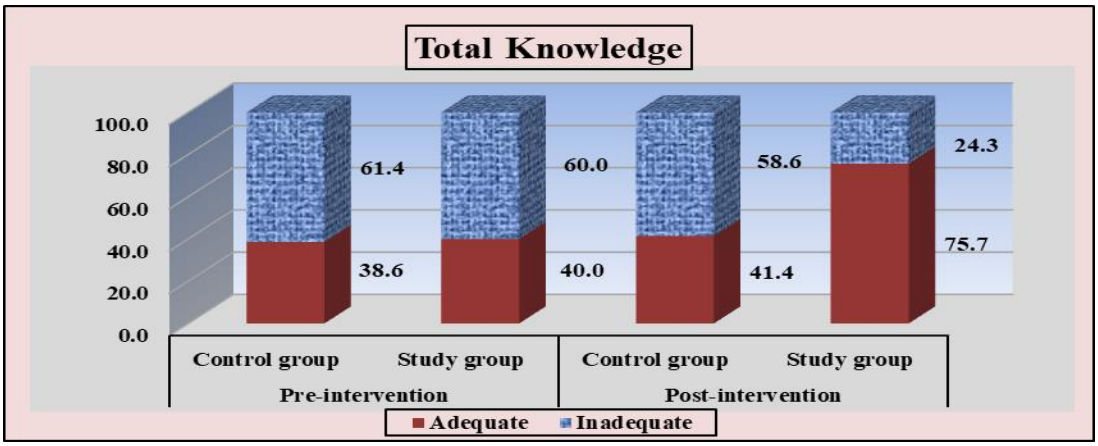

Figure (1): Distribution of the study and control sample according to their total knowledge score regarding urinary tract infection in both study and control groups at pre- and post-intervention phases (n=140)

Figure (2): Distribution of the study and control sample according to their total self-reported health practices score regarding urinary tract infection in both study and control groups at pre- and post-intervention phases (n=140)

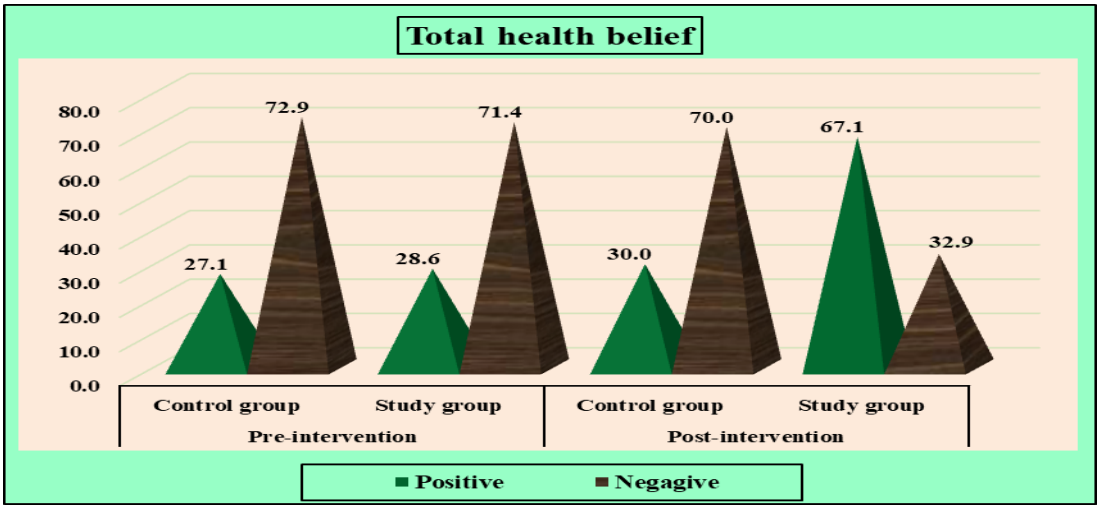

Figure (3): Distribution of the study and control sample according to total health belief score toward urinary tract infection in both study and control groups at pre- and post-intervention phases (n=140).

Table (3): Correlation between total knowledge and (total self-reported health practices and total health belief) scores of the studied women regarding urinary tract in both study and control groups at pre- and post-intervention phases (n=140).

Variables	Total knowledge score							
	Control group (n=70)				Study group (n=70)			
	Pre-intervention		Post-intervention		Pre-intervention		Post-intervention	
	r	P-value	r	P-value	r	P-value	r	P-value
Total self-reported health practices	0.435	0.000**	0.667	0.000**	0.519	0.000**	0.682	0.001. **
Total health belief score	0.508	0.000**	0.586	0.000**	0.530	0.000**	0.599	0.001**

Table (4): Correlation between total health belief score and total self-reported health practices score of the studied women regarding urinary tract in both study and control groups at pre- and post-intervention phases (n=140).

Variables	Total health belief score							
	Control group (n=70)				Study group (n=70)			
	Pre-intervention		Post-intervention		Pre-intervention		Post-intervention	
	r	P-value	r	P-value	r	P-value	r	P-value
Total self-reported health practices	0.478	0.000**	0.492	0.000**	0.510	0.000**	0.634	0.001**

Discussion

About 20% of pregnancies are caused by urinary tract infections (UTIs), making them the most common pregnancy-related illnesses. They are regarded as the most prevalent pregnant illness, behind anemia. Additionally, 10% of all hospitalizations during pregnancy are attributable to them. A urinary tract infection is any of a variety of illnesses caused by microorganisms invading the normally sterile urinary system. **(Gendel, 2021).** Because of normal physiological changes, the pregnant woman is more susceptible to urinary tract infections due to changes in both the anatomical and hormonal effects. These alterations cause urine to remain in the bladder for an extended period of time, which promotes the growth of germs. Additionally, relaxation of the vesico-ureteric junction causes urine to reflux from the bladder to the ureter and subsequently to the renal pelvis, which can impact the renal parenchyma and impact its function **(Gilstrap, 2023),** additionally, the higher concentration of glucose, amino acids, and other nutrients in pregnant women's urine promotes the growth of bacteria. The immune system is known to be weakened during pregnancy. These alterations, together with a small urethra and poor perineal hygiene brought on by the growing uterine obstruction; increase the risk of having UTI **(Gazmararian et al., 2020).**

One of the earliest theories developed specifically for behaviors connected to health is the Health Belief Model (HBM). The cognitive model is most commonly used in research on health behavior and compliance. The HBM was developed in the 1950s by a group of social psychologists to look at the causes of low involvement in illness prevention and detection programs. A crucial and precise pattern used to ascertain the relationship between health beliefs and behavior is the Health Belief Model**. (Alyafei et al., 2024).** By educating expectant mothers the proper precautions to take, nurses may help avoid or alleviate urinary tract infections. The most crucial factors in educational planning are the choice of theoretical model, issue identification, and efficacy. One of the theories used to explain preventative behaviors is the health belief model. Research using the HBM to raise knowledge and acceptance of UTI-related attitudes and practices. (**jadsadegh et al., 2024).**

Regarding demographic characteristics. With mean ages of 28.44±5.86 and 27.46±5.71 years, respectively, the current study's results demonstrated that more than half of the study group and half of the control group were in the 25–35 age range. The majority of women with UTI infections

during pregnancy were under thirty years old, according to **Rajani et al., (2022),** study on the prevalence, clinic-bacteriological profile, and antibiotic resistance of symptomatic urinary tract infections in pregnant women. However, this conclusion contradicts that of **Jacob et al., (2022),** who studied maternal age and pregnancy stage as factors influencing UTI in pregnancy: A Case of Tamale, Ghana, and found that the prevalence of UTI infection was proportionally high among pregnant women within the age group of 15-25 years. Pregnant women of the age group of 26-35 years were less likely to get UTIs as compared to those of the age group 15-25 years.

In terms of residence, the current investigation revealed that two third of the control group and half of the study group resided in a rural region. According to the study, this might be due to the poor educational attainment of rural areas, which is characterized by a lower degree of infection prevention knowledge. **Abd Elfatah, (2021),** who conducted research on pregnant women's knowledge and attitudes surrounding urinary tract infections, validated this conclusion. This conclusion contradicts of **Esan, (2023),** study on pregnant women's knowledge regarding the prevention of urinary tract infections in Kirkuk City, which found that 99% of the study sample's inhabitants lived in urban regions.

It was determined that, educational attainment, more than half and two third of the study and control groups, respectively, had completed secondary school. This conclusion was consistent with **El Sayed, (2019),** findings as well as those of **Abd Elfatah, (2021),** who studied pregnant women's knowledge and attitudes about urinary tract infections. who carried out study on Pregnant women perception regarding urinary tract infection From the researchers point of view this might be because most of the rural families prefer to married their girls than to complete their education This finding disagree with **Marami et al., (2023),** who studied the Urinary tract infection, antimicrobial susceptibility pattern of isolates, and associated factors among women with a post-fistula at public health facilities.

As regards occupational status, The majority of the women in the study were housewives, according to a study by **Busra et al., (2024),** on the evaluation of the relationship between genital behaviors and urinary tract infections in the pre-pregnancy and first trimester of pregnancy, and a study by **Abd Elfatah, (2021),** on the Knowledge and Attitudes of Pregnant Women regarding Urinary Tract Infection. Additionally, **Scoular et al., (2022),** found a similar finding. This carried out study on Mycoplasma genitalium and Other Reproductive Tract Infections in Pregnant Women, Papua New Guinea. Finally, more than half and two third (of both study and control groups respectively didn't have enough monthly income. Generally, there was no statistically significant difference between study and control groups regarding personal characteristics ($p>0.05$). That is the two groups under study homogenous. This finding was in the same line with **Getaneh et al., (2021),** who conducted a study on Prevalence of Urinary Tract Infection and Its Associated Factors among Pregnant Women in Ethiopia, which reported that 62.4 % of the monthly income of the studied pregnant women was insufficient. on the other hand, this finding contrary with **Mohamed, (2020),** who carried out the study on Self-efficacy and practices of pregnant women with Symptomatic Urinary Tract Infection, who found that nearly half of the studied pregnant women had sufficient monthly income.

Concerning Obstetrics history of studied

women, the present study, revealed that mean of gestational ages of 9.93±1.15 and 10.19±1.43 weeks, respectively, the current study showed that almost two-thirds of the study and control groups had gestational ages between 10 and 12 weeks. This result is consistent with **Larri et al., (2022**) study, "Maternal Age and Pregnancy Stage as Determinants of UTI in Pregnancy: A Case of Tamale, Ghana," which found that the study and control groups noticed greater rates of UTI in the first trimester of pregnancy (41.0%) and (50%) respectively. From the researchers point of view this related to rapid hormonal changes production during pregnancy and is associated with the first trimester of pregnancy. Showed that the highest percent. However, this finding contradicts the findings of a research on urinary tract infections in pregnancy and their effects on maternal and perinatal outcomes conducted by. **Balachandran et al., (2021).** Additionally, this finding contradicts that of. **Alejandra, (2023),** investigation into the social risk factors associated with UTIs in expectant mothers.

As regard gravida half of the study group and control groups, respectively, over half of the participants were primigravida. In a study on the prevalence of urinary tract infections and potential risk factors among pregnant women enrolled in a semi-urban tertiary care center in central Travancore, **Kalinderi et al., (2023),** found that more than half % of the study and control group of the samples under investigation were primigravida. However, this result is consistent with **Mohamed, (2020),** findings that roughly two-thirds of the pregnant women in the study were multigravida.

Concerning parity more than half of both study and control groups respectively were nulliparous. **Gimbel et al., (2023),** reported that more than half of the study and control groups were nulliparous, which is consistent with this conclusion. Additionally, this finding is consistent with **Balachandran et al., (2021),** observation that nulliparous women experienced urinary infections at a higher rate than multiparous women. However **Vicar, (2022),** found that over half of the study and control group of the studied sample were multipara. This finding contradicts the findings of a study on urinary tract infection and associated factors among pregnant women receiving antenatal care at a primary health care facility in the Northern Region of Ghana.

As regard the mode of last delivery, according to the current study, cesarean section (CS) accounted for two third of the study and control groups, respectively. In terms of obstetric history, there was often no statistically significant difference between the study and control groups ($p>0.05$). Thus, the two research groups are homogeneous. This outcome is consistent with research by **Ashour et al., (2022),** on the impact of using self-efficacy nursing guidelines on pregnant women urinary. Tract Infections, who reported that more than one-half of study and control groups had previously delivered through caesarean section from the researchers point of view this related to increase level of sedentary life and decrease exercises.as well as women preferring cesarean section. Meanwhile this finding disagree with **Maguire et al., (2021),** who carried out study on pilot study exploring the incidence of lower urinary tract symptoms during pregnancy in a district general hospital in Northern Ireland, and noted that compared to mode of delivery in their pregnancy, that is, whether they had a vaginal birth, delivery or caesarean section. Women were nearly twice more likely have a vaginal delivery in their

first pregnancy with little half compared to those who had a cesarean section was quarter of study sample.

Concerning the study sample's total knowledge of urinary tract infections. The results of this study display that, more than one third of study group and one third of control group had adequate knowledge regarding urinary tract infection at pre-intervention phase. Meanwhile, at post-intervention phase, more than two third and one third of both the study and control groups respectively had adequate knowledge. This result is consistent with. **Abu Aleinein, (2023),** who conducted study on Knowledge and prevalence of urinary tract infection among pregnant women in Lebanon, who noted that pre intervention group two third of the studied sample had average knowledge regarding UTI compare with good knowledge in all post intervention group, also this finding agree with **Ahmadi, (2020),** who carried out study on The effect of educational intervention program on promoting preventive behaviors of urinary tract infection in pregnant women ,who noted that Improvement of knowledge in the intervention group compared to the control group after the intervention was due to the educating pregnant women about information related to of UTI., this result highlights the importance of the development and implementation of educational programs aimed at increasing awareness about the risk of urinary tract infection during pregnancy may be beneficial in preventing such infections.

Related to total mean scores of self-reported health practices domains regarding urinary tract infection in both study and control groups at pre, post-intervention and follow up phases, the present result illustrated that Prior to intervention, there was no statistically significant difference between the two groups' mean scores for women's self-reported health behaviors related to urinary tract infections (P>0.05). Nonetheless, the study group's overall mean score for self-reported health behaviors was substantially greater than the control group's during the post-intervention and follow-up phases (P ≤001). These results are consistent with **El-bana, (2020),** who reported a very statistically significant difference (p<0.001) between the self-care behaviors of the women in the study and urinary tract infections at post-intervention phases. Additionally, this conclusion is consistent with **Ahmed, (2023).** They revealed that, among women in the intervention group compared to the control group, there were highly statistically significant variations in the mean score of all self-care practices categories for urinary tract infections in post-intervention compared to pre-intervention (p=0.001**). The present study hypothesis Π is supported by these findings.

Regarding total health belief score toward urinary tract infection in both study and control groups at pre- and post-intervention phases, at the pre-intervention phase, quarter of the study group and the control group had good health belief scores for urinary tract infections. In the meantime, both the study and control groups exhibited good health beliefs in the post-intervention period, with two third and quarter respectively. This information is consistent with. **Elbialy, (2019),** study, "Effect of Preventive Program about Reproductive Tract Infections on Knowledge, Beliefs, and Practices among Rural Women Based on Health Belief Model," which examined the groups under study in relation to their overall belief scores over the course of the study. It was clear that pre- program, quarter of both the study and control groups respectively had positive beliefs. Immediately and three months post

the educational intervention, Positive beliefs significantly increased among the majority of the study group (91.8% and 95.3%, respectively; p=0.001). On the other hand, the control group's overall belief score did not vary significantly, with just quarter of them having positive views three months later. Similarly, two months following the self-learning package, **Elbialy et al., (2019),** discovered a very statistically significant improvement in the intervention group's total belief score, whereas the control group did not exhibit any meaningful change. Furthermore, two months after the intervention, the intervention group's overall belief ratings showed a highly significant improvement, whereas the control group showed no change **Abd El Aziz et al., (2016).**

According to the results, it was successful in enhancing knowledge, behaviors, and practice regarding UTIs during pregnancy, specifically with regard to perceived susceptibility, perceived severity, perceived benefits, and prompt to action. As a result, the intervention improved treatment compliance, shown a greater rate of recovery, and decreased infection among the pregnant women under study as compared to the control group.

Regarding correlation between total knowledge and (total self-reported health practices and total health belief) scores of the studied women regarding urinary tract in both study and control groups at pre -and post-intervention phases. demonstrated that; there was a highly significant statistical positive correlation between knowledge score and total scores of (self-reported health practices and health belief) in both groups at pre -and post-intervention phases (P≤0.001). **Sunda, (2024),** who conducted research on the knowledge, attitudes, and practices of pregnant women regarding urinary tract infections in a few health facilities in Ekiti state, Nigeria, supports this finding by demonstrating that there is a positive statistically significant correlation between women's knowledge of UTIs. Both the pre- and post-intervention groups' self-reported behaviors and their knowledge and beliefs about UTIs were shown to be statistically significantly correlated. In the meanwhile, this is in contrast to **Ahmed, (2023),** who reported that there is a highly statistical negative correlation between the knowledge and health belief p<0.001**. Additionally, the correlation between the health practices and health belief; it was found a highly statistical negative correlation between the health practices and severity of symptoms post intervention p<0.001**

As regard correlation between total health belief score and total self-reported health practices score of the studied women regarding urinary tract in both study and control groups at pre- and post-intervention phases demonstrated that; there was a highly significant statistical positive correlation between total health belief score and total self-reported health practices score in both groups at pre- and post-intervention phases (P≤ 0.001) This finding is consistent with **Baker, (2020),** research on the impact of health education programs based on the health belief model on the prognosis of urinary tract infections in pregnant women. HBM and women's practices scores showed a statistically significant independent positive correlation. Furthermore, the intensity of the symptoms and the bothersome scores were positively correlated with time. Additionally, the HBM was positively predicted by the knowledge score, on the other hand this result contradicts with **Ahmed, (2023),** who reported that the correlation between the health practices and health belief; it was

found a highly statistical negative correlation between of these two variables of post intervention p <0.001.

Conclusions

Based on the study findings, less than half of the study and control group had adequate knowledge and satisfactory self-reported health practice regarding urinary tract infection at pre intervention. Meanwhile, two thirds and less than half of both study and control group had adequate knowledge and satisfactory self-reported health practice at post intervention phase.in addition after utilization of health belief model which has a main role in prevent UTIs during pregnancy. Finally, it cleared that current finding Support research hypotheses and achieved aim of the study.

Recommendations

-Frequent organized education activities to be included during antenatal care about urine tract infections during pregnancy, that focus on proper self-care practices as (personal hygiene, genital hygiene, particularly urination habits, and nutritional habits) that prevent UTI during pregnancy.

-Therefore, it can be suggested that the mentioned model can be used as one of the strategies for prevention of Urinary Tract Infection in women.

-Guidelines about preventive measures of Urinary Tract Infection (UTI) for pregnant women should be providing during antenatal care.

Further studies:

-Further Research need for larger sample of women to determine the different risk factor regarding to Urinary Tract Infection UTI throughout maternity life cycle and related with socio demographic factors in Egypt.

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تأثير برنامج تعليمى قائم على نموذج المعتقدات الصحية على الوقاية من عدوى المسالك البولية لدى السيدات الحوامل

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عدوى المسالك البولية أثناء الحمل من المضاعفات الشائعة ولكنها قد تكون خطيرة، مما يشكل مخاطر على صحة الأم والجنين.حيث يؤدي الحمل إلى تغييرات تشريحية وفسيولوجية تزيد من التعرض لعدوى المسالك البولية، مما يجعل من الضروري فهم الديناميكيات الفريدة لهذه العدوى في فترة الحمل. حيث يمكن أن تؤدي عدوى المسالك البولية غير المعالجة إلى مضاعفات مثل التهاب الحوض والكلية، والولادة المبكرة، وانخفاض الوزن عند الولادة، وحتى تسمم الدم فى بعض الاحيان، مما يسلط الضوء على أهمية الوقاية التشخيص والعلاج المبكر. لذلك هدفت هذة الدراسة إلى تأثير برنامج تعليمى قائم على نموذج المعتقدات الصحية على الوقاية من عدوى المسالك البولية لدى السيدات الحوامل. وأجريت في العيادة الخارجية لأمراض النساء والتوليد في مستشفى جامعة بنها. تم أخذ عينة غرضية مكونة من ١٤٠ سيدة وتم تقسيمهم إلى مجموعة دراسة (٧٠) ومجموعة ضابطة (٧٠). وقد أسفرت النتائج إلى أن بعد التدخل، أظهر متوسط درجات المعرفة والممارسات والمعتقدات الصحية لمجموعة الدراسة زيادة كبيرة مقارنة بالمجموعة الضابطة ($p = <0.001$). فيما يتعلق بمقياس نموذج المعتقدات الصحية، لا يوجد فرق ذو دلالة إحصائية في المتوسط الإجمالي لدرجات المعتقدات الصحية للنساء تجاه عدوى المسالك البولية بين المجموعتين قبل التدخل ($P>0.05$). ومع ذلك، في مرحلتي ما بعد التدخل والمتابعة، كان المتوسط الإجمالي لدرجات المعتقدات الصحية في مجموعة الدراسة أعلى بكثير من الدرجة في المجموعة الضابطة ($P \leq 001$). وقد لخصت النتائج إلى أن تنفيذ البرنامج التعليمي القائم على نموذج المعتقدات الصحية فعالاً في تحسين المعرفة والممارسات الصحية المبلغ عنها ذاتيًا والمعتقدات الصحية فيما يتعلق بالوقاية من عدوى المسالك البولية بين النساء الحوامل في مجموعة الدراسة. وقد أوصت الدراسة إلى ضرورة توفير إرشادات حول التدابير الوقائية من عدوى المسالك البولية للنساء الحوامل بناءً على نموذج الاعتقاد الصحي أثناء متابعة الرعاية قبل الولادة.