

The Effect of Theory of Planned Behavior-Based Education in Adopting the Urinary Tract Infection Prevention Behavior in Pregnant Women: A Randomized Controlled Trial

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Research

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Abstract

Background: Urinary tract infection (UTI) is a common infection in women, and it is more likely to occur during pregnancy due to mechanical and hormonal changes in pregnant women. Urinary tract infections can cause many complications for both mother and fetus. Given the roles of health behavior in the prevention of urinary tract infections and the nature of the theory of planned behavior-based education in behavioral change, the present study aimed to determine the effect of the theory of planned behavior-based education in teaching the urinary tract infection prevention behavior in pregnant women.

Methods: The present study was a randomized controlled trial in which 100 pregnant women, who visited the comprehensive health service centers of Zarinshahr City, were randomly divided into two groups, intervention and control, containing 50 individuals. The data collection tools were a urine test and a questionnaire designed based on the theory of planned behavior. Five education sessions were held based on the constructs of the theory of planned behavior. We analyzed the effect of education review and data using independent t-tests, Mann-Whitney test, chi-square test, and repeated measures ANOVA (analysis of variance) one and three months after the educational intervention.

Results: After implementing the educational intervention, the mean scores of knowledge and constructs of the theory of planned behavior significantly increased in the intervention group over time ($P < 0.001$), while the difference was not significant in the control group over time. After the educational intervention, the incidence of urinary tract infections was 4.3 % in the intervention group and 21.3% in the control group.

Conclusion: Given the positive effect of education based on the theory of planned behavior in changing the pregnant mothers' behavior, the theory can be used as a suitable intervention framework for implementing the educational programs to prevent urinary tract infections.

Trial registration: Name: Iranian Registry of Clinical Trials. Registration number: IRCT20170214032575N1. Registration date: 2019-12-12 [retrospectively registered].

Plain English Summary

Urinary tract infections are ranked among the most common infections affecting people of all ages. Globally, it is estimated that 150 million people contract urinary tract infections annually, caused by the presence and proliferation of microorganisms in the urinary tract. This disease is more common in pregnant women than non-pregnant ones due to mechanical and hormonal changes during pregnancy. Some health behaviors, such as not having frequent sexual activity, wearing appropriate underwear, and not delaying urination are behaviors that can prevent urinary tract infections. Despite the importance of these issues, many women do not have enough information about them. The individuals' perceptions that I may also have the urinary tract infection and the belief that urinary tract infections can be prevented by taking preventive behaviors can help prevent urinary tract infections. The individuals' ability to perform certain behaviors, such as sexual behavior habits and personal hygiene, which play important

roles in the development of urinary tract infections during pregnancy, is another factor that can affect the urinary tract infections during pregnancy. The role of social support is also important to follow preventive behaviors. Therefore, if mothers feel that the urinary tract infection prevention behaviors are approved and supported by family members, friends, health care staff, and other important people, they will show a greater desire to exhibit the behaviors that prevent urinary tract infections. Education can increase awareness, change attitudes, and create a sense of empowerment in individuals in the field of behaviors for preventing the urinary tract infections.

Background

The urinary tract infection(UTI) is a common gynecological disease as a serious health problem in the world in the 21st century, caused by the presence and proliferation of microorganisms in the urinary tract (1, 2). UTI affect 150 million people worldwide every year (1, 3, 4), and one-third of all women experience urinary tract infections in their lifetime (5). This disease is more common in pregnant women than non-pregnant ones due to mechanical and hormonal changes during pregnancy (6–8). After anemia, UTI is the second most common health problem among pregnant women (9). *Escherichia coli* is the cause of 80–90% of urinary tract infections (10–12). UTI in pregnancy occurs as symptomatic and asymptomatic bacteriuria among which the latter is the most common infection during pregnancy (13).

The prevalence of asymptomatic urinary tract infections compared to symptomatic infections is reported to be 2–15% in pregnant women (14, 15) and 6–11% in Iran (16).

UTI has various complications on mothers and fetuses, including pyelonephritis, Pre-eclampsia (PE), anemia, septic shock, and Endometritis, premature delivery, and subsequently the fetal death, respiratory failure, low birth weight, mental retardation, intrauterine growth restriction, and IQ reduction (16–19).

Some health behaviors, such as not having frequent sexual activity, wearing appropriate underwear, and not delaying urination are behaviors that can prevent UTI. Despite the importance of these issues, many women do not have enough information about them, and studies indicate that women have low knowledge about the UTI prevention behavior (16, 20, and 21). In addition to knowledge, the individuals' attitudes, and way of thinking are also important factors in the possibility of UTI. For example, the individuals' perceptions that I may also have the urinary tract infection and the belief that urinary tract infections can be prevented by taking preventive behaviors can help prevent UTI (13, 22).

Subjective norms are other issues that can play important roles in UTI, reflecting the individuals' perception of whether or not others approve the behaviors. Therefore, if mothers feel that the urinary tract infection prevention behavior are approved and supported by family members, friends, health care staff, and other important people, they will show a greater desire to exhibit the behaviors that prevent UTI.

The present study emphasized the role of family, especially the husband, in maintaining sexual health (as informal abstract norms) to prevent UTI in pregnancy (13, 23, 24).

Other studies have considered the effective and useful roles of subjective norms, physician, midwife (as formal norms), and family (as informal norms) in preventing disease.

The individuals' ability to perform certain behaviors, such as sexual behavior habits and personal hygiene, which play important roles in the development of UTI during pregnancy, is another factor that can affect UTI during pregnancy. This sense of ability is considered as the perceived behavioral control (10, 25).

Education can increase awareness, change attitudes, and create a sense of empowerment in individuals in the field of behaviors for preventing UTI. The theory of planned behavior is an important theory of behavioral change as the main framework of the present research. This theory is applicable to predict and understand behaviors. According to this theory, the behavioral intention is the most important determinant of behavior; and other main constructs of this theory (attitude, Subjective norms, and perceived behavioral control) affect this theory in special ways (26).

Given that influential factors such as the individuals' attitudes, presence of others, and the sense of control over the behaviors for preventing UTI are main issues in adopting behaviors for preventing the urinary tract infections, and they are constructs of theory of planned behavior, the present study was designed and conducted with an aim to determine the effect of education based on the theory of planned behavior on teaching behaviors for preventing UTI in pregnant women (Fig. 1).

Methods

Study design

The present study was a randomized controlled trial. The statistical population consisted of pregnant women who visited the comprehensive health service centers of Zarinshahr (a city in central Iran) in 2019 (Fig. 2).

Inclusion criteria: being in the first trimester of pregnancy, not having a urinary tract infection based on a laboratory test, not having chronic diseases such as diabetes, not taking antibiotics and immunosuppressive drugs.

Exclusion criteria: Continuous absence from training sessions (absence of more than a session during the training intervention), non-completion of the questionnaire and referral due to medical urgency (abortion, etc.).

Sampling Method And Calculation Of Sample Size

Sampling was randomly conducted in accordance with the population. In Zarinshahr, there are five comprehensive health service centers from which 100 pregnant women were randomly and systematically selected according to the list of pregnant women. A computer random-number generator

was used to generate the random sequence for group allocation (50 individuals in the intervention group and 50 individuals in the control group). An investigator blinded to participants selection kept the random sequence and allocated the participants to intervention and control groups at a 1:1 ratio.

The sample size was obtained equal to 44 for each group according to the following equation, and 49 individuals in each group with a 10% drop.

$$N = \frac{(Z1 + Z2)^2(2s)^2}{d^2}$$

Z1: Confidence level of 95% was equal to 1.96.

Z2: The test power factor of 80% was equal to 0.84.

S: Estimation of the mean standard deviation of score for each variable in the two groups.

d: The minimum difference of mean scores of each variable between two groups, indicating a significant differences and was considered to be 0.6 s.

$$n = \frac{(1.96+0.84)^2 (2S)^2}{0.36S^2} = 44$$

Data Collection Method

In the study, the data collection method included a questionnaire based on constructs of theory of planned behavior. The questionnaire consisted of three parts: the first part included demographic questions, the second part included questions about knowledge, and the third part included questions about constructs of the theory of planned behavior, and included questions about attitude, abstract norms, perceived behavioral control, and behavioral intention and behavior. There were 29 questions about knowledge, designed in Yes and No, and multi-choice questions. The correct option received score 1, and wrong option was given score 0. The knowledge scores ranged from 0 to 29. For example, "Which one of cases were symptoms of the bladder infection?" About the attitude, 17 questions were designed in the questionnaire on a 5-point Likert scale from strongly agree to strongly disagree, and the scores ranged from 0 to 68. For example, "I may also have a urinary tract infection." The perceived behavioral control contained 18 questions which were scored similar to the attitude; and the scores ranged from 0 to 72. For example, "I never hold urinating, even if the frequent urination is tiresome".

Three questions were designed based on the three-point Likert scale from high to low to evaluate the subjective norms in the questionnaire. The range of scores was from 0 and 6. For example, "Spouses and other family members play significant roles in accepting the urinary tract infection prevention behavior". There were 7 questions for assessing the behavioral intention and they were designed based on a 5-point Likert scale with scores ranging from 0 to 28. For example, "I am going to consume 8 glasses of water per day."

22 questions were considered to measure the behavior in a yes/no design; the correct answer was scored 1, and the wrong answer was scored zero; and the scores ranged from 0 to 22. For example, "I always wear cotton underwear". Finally, all scores were calculated based on 100 for ease of comparison.

Validity And Reliability Of Data Collection Tools

The validity and reliability of the questionnaire were proven in a study by Shamsi et al. (22). The content validity ratio and content validity index were used to assess the validity of study; and the questionnaire validity was confirmed. The internal consistency method was used to determine the reliability so that Cronbach's alpha coefficients were 0.79 for knowledge, 0.86 for attitude, 0.70 for subjective norms, 0.71 for perceived behavioral control, 0.76 for behavioral intention, and 0.81 for behavior that confirmed the reliability.

Intervention

Telephone calls were made to invite women to attend the study. Five training sessions were held and designed and implemented based on the behavioral goals in order to improve the constructs of the theory of planned behavior. Table 1 presents a brief description of the training sessions (Table 1).

Table 1

Summary of goals and strategies used in training sessions based on the constructs of the theory of planned behavior

Constructs	Behavioral goals of education	Domain	Education method
Knowledge	Pregnant women should define the urinary tract infection in at least a sentence.	Cognitive	Lecture, question and answer
	Pregnant women should describe at least five symptoms of a bladder infection.	Cognitive	Lecture, question and answer
	Pregnant women should name various ways to prevent urinary tract infections.	Cognitive	Lecture, question and answer
Attitude	Pregnant women should understand the importance of having the urinary tract infections during their pregnancy and discuss it for 5 minutes.	Affective	Lecture, group discussion, and brainstorming
	Pregnant women discuss the side effects of urinary tract infections on infants and mothers and discuss them for 5 minutes.	Cognitive, Affective	Lecture, group discussion, and brainstorming
	Pregnant women should discuss ways to prevent urinary tract infections and discuss them for 5 minutes.	Cognitive, Affective	Lecture, group discussion, and brainstorming
Subjective norms	Pregnant women should be encouraged to perform urinary tract infection prevention behaviors by others.	Affective	Lecture, question and answer
	Pregnant women should be introduced to the roles of influential individuals (doctors, midwives, family members, and friends) in preventing the urinary tract infections and discuss them for 5 minutes.	Cognitive, Affective	Group discussion, and brainstorming
	Pregnant women should understand the attitudes of those around them towards their urinary tract infection prevention behaviors and discuss them for 5 minutes.	Affective	Group discussion
Perceived behavioral control	Pregnant women should feel empowered to do the right nutritional behaviors and how to dress.	Psycho-motor	Role playing
	Pregnant women should maintain their sexual and urinary hygiene.	Psycho-motor	Group discussion

Constructs	Behavioral goals of education	Domain	Education method
Behavioral intention	Pregnant women should change their underwear at least 3 times a week for the next 2 weeks.	Cognitive, Emotional	Lecture, group discussion, and brainstorming
	Pregnant women should decide to wear baggy pants during pregnancy.	Psycho-motor	Practical display
	Pregnant women should practice proper eating habits (e.g. drinking water, and eating yogurt, Cornus mas, and barberry)	Psycho-motor	Practical display

Data analysis

SPSS 20 software was used to analyze data. We used the independent t-test to analyze demographic variables (to analyze quantitative variables such as age), and Mann-Whitney test to analyze the rank qualitative variables such as education level, and Chi-square or Fisher's exact test to analyze the nominal qualitative variables such as gender. The repeated-measures analysis of variance compared the mean scores of the theory of planned behavior constructs and knowledge in each group before and after the intervention. The Kolmogorov-Smirnov test determined the data normality; and the Levene's test determined the equality of variances.

Ethical Considerations

In the present study, the participants received complete information about the research purposes. They were also ensured that their information would remain confidential. The clinical trial was registered on the website of the Iranian Registry of Clinical Trials (IRCT20170214032575N1) and received a code of ethics (IR.MUI.RESEARCH.REC.1398.294) from the National Ethics Committee in the Iranian Biomedical Research (file:///C:/Users/DRshahnazi1/Downloads/4ed93mdxvizfn%20(2).pdf).

Results

In the study, 46 individuals were examined in the intervention group with an age range of 17 to 42 years, and 47 individuals in the control group with an age range of 17 to 43 years.

Results of statistical tests indicated that two groups did not differ significantly in terms of demographic variables (Table 2).

Table 2
Comparison of demographic variables in the research groups

Variable	Intervention group	Control group	P-value
Job	42 (91.3)	46 (97.9)	0.17*
Housewife	4 (8.7)	1 (2.1)	
Employee			
Place of residence	25 (54.3)	20 (42.6)	0.25 **
Personal	21 (45.7)	27 (57.4)	
Rental			
Education level	6 (13)	5 (10.6)	0.13***
Under high school diploma	23 (50)	9 (19.2)	
high school diploma and associate degree	17 (37)	33 (70.2)	
Bachelor			
Monthly income	3(6.5)	5 (10.6)	0.74***
Less than 10 million Rials	13 (28.3)	9 (19.2)	
10–20 million Rials	30 (65.2)	33 (70.2)	
More than 20 million Rials			
* Fisher's exact test			
** Chi-square test			
*** Mann-Whitney test			

Repeated-measures ANOVA indicated that scores of knowledge and constructs of the theory of planned behavior increased significantly in the intervention group over time ($P < 0.001$), while the difference was not significant in the control group over time (Table 3).

Table 3

Comparison of mean scores (from 100) of knowledge and constructs of theory of planned behavior before and after the intervention in control and intervention groups

Construct	Group	Before the intervention	Immediately after the intervention	Three months after the intervention	P-value*
		Mean (sd)	Mean (sd)	Mean (sd)	
Knowledge	Intervention	51.4 (17.2)	94.9 (4.2)	88.2 (9.2)	< 0.001
	Control	49.3 (13.5)	55.7 (12.2)	59.6 (13.8)	
Attitude	Intervention	70.9 (12.7)	90.4 (7.9)	87.9 (9.3)	< 0.001
	Control	71.2 (11.1)	72.4 (10.6)	73.9 (11.1)	
Subjective norms	Intervention	85 (25.3)	98.5 (7.1)	96.2 (12.9)	0.04
	Control	85.3 (25.2)	85.4 (24.1)	85.4 (30.3)	
Perceived behavioral control	Intervention	75.5 (14.2)	92.1 (9.6)	90.1 (9.3)	< 0.001
	Control	76.6 (10.5)	70.1 (10.8)	76.5 (14)	
Behavioral intention	Intervention	81.2 (15.3)	93.1 (10.4)	93.1 (8.8)	< 0.001
	Control	79.3 (13.6)	73.9 (12.1)	80.9 (16.7)	
Behavior	Intervention	71.5 (14.5)	97.1 (4.8)	95.9 (6.2)	< 0.001
	Control	75.2 (14)	73.8 (17.3)	79 (16.1)	

*Repeated M ANOVA

Chi-square test indicated that the frequency of urinary tract infections was significantly lower than the control group three months after the educational intervention in women of the intervention group (Fig. 3).

Discussion

The present study aimed to determine the effect of education based on the theory of planned behavior in adopting behaviors for preventing urinary tract infections in pregnant women. In the study, we examined the pregnant women's knowledge by measuring the existing problems before performing an educational intervention based on results of the pre-test, and then the pregnant mothers were received the necessary training in various fields such as recognizing symptoms of urinary tract infection, prevention methods, and testing to prevent urinary tract infections using the educational booklets and pamphlets, indicating an increase in the knowledge score of the intervention group after the program. The research finding was consistent with studies by Gonzalez et al (27), Haider et al (8), Indhumol et al (28). In the present study, the mean attitude score increased after the intervention, indicating the favorable effect of group discussion based on the theory of planned behavior. Therefore, the pregnant women divided into small groups and discussed issues about the ways to prevent the urinary infection. Under the supervision of the

researcher, they exchanged views, and thus the individuals expressed their thoughts and ideas in this field and corrected them by the help of the researcher. The result was consistent with a study by Ahmed et al. (20). Since the family support is an important factor in adopting the urinary tract infection prevention behaviors, the husbands were asked to attend one of the training sessions with their wives to attract the family support. Since they were important subjective norms for their wives, their support were attracted properly. In the study, we saw an increase in mean scores of subjective norms in the post-training intervention group, while a meeting was held with the center's physician and midwife to provide counseling and support services and they were asked to provide the necessary support for pregnant women for education. Therefore, it seems that the guidance of health personnel through the theory of planned behavior in training classes will be very valuable and useful to prevent urinary tract infections in pregnant women. The result was consistent with results of studies by Abd El Aziz (7) and Nezhad Sadeghi. (13). The intervention result indicated an increase in mean score of perceived behavioral control in the intervention group. The increase could indicate the desired effect of education through role-playing, so that the behavior such as nutritional behaviors and way of dressing were simply and separately explained by the researcher in a way that each part of the behavior could be easily done by the pregnant woman. The pregnant mothers were then asked to play roles, leading to active thinking and participation and higher self-confidence in the participants. The result was consistent with a study by Song (29). In the study, the mean score of behavioral intention increased after the intervention. The increase in score might be due to the use of practical demonstration techniques in a way that foodstuffs such as barberry, Cornus mas, and water were displayed in the class and used symbolically by the participants to demonstrate proper eating habits. The result was consistent with a study by Conner et al. (30) and Shamsi et al. (22).

Findings of the present study indicated that the mean score of the urinary tract infection prevention behavior increased compared to the pre-intervention. The increase might be due to the use of film and practical screening, for example, a suitable pants for pregnancy was shown and a number of pregnant mothers wore loose and comfortable pants and showed other participants that not only there was no contraindication, but they were also suitable. The result was consistent with a study by Tehrani et al. (31), while it was different from a study by Ahmadi et al. (32) due to the differences between the research groups.

Conclusion

The research results indicated that the theory of planned behavior-based education, including the participants' attitudes and beliefs, had positive functional effects on most behaviors for preventing the urinary tract infections in pregnant women probably due to the fact that the education program sought to identify the participants' weaknesses through group discussion and provide the appropriate training, thereby changing the individuals' attitudes. The study also indicated that the perceived behavioral control as another construct of the theory could be strengthened in participating pregnant mothers and their self-confidence could increase by relying on the role-playing. Using the practical display technique, the behavioral intention as another construct of the theory could be well developed in the learners' mind; and

the desired behavior change could be made in learners using the film screening strategy. Therefore, the theory can be an appropriate intervention framework for implementing the educational programs to prevent urinary tract infections.

Limitations

Since the present study was conducted as a pilot in a city of Iran, the necessary precautions should be taken in generalizing the results to other regions.

Abbreviations

UTI
urinary tract infection; ANOVA:analysis of variance; TPB:theory of planned behavior

Declarations

Ethics approval and consent to participate:

Approval to conduct the study was obtained from the Research Ethics Committee of Isfahan University of Medical Sciences (ID- number: IR.MUI.REC.1396.3.578). Written informed consent was obtained from the participants. Furthermore, the pregnant women were informed that they had the right to withdraw from the study at any time, and were assured of the confidentiality of the study.

Consent for publication:

Not applicable.

Availability of data and materials:

The data that support the findings of this study are available from Deputy of research of Isfahan University of Medical Sciences but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Isfahan University of Medical Sciences.

Competing interests:

The Authors declare that they have no competing interests.

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Authors' contributions:

Initially conceived and designed the study: Hossein Shahnazi and Sheida Moradpour

Conducted the analysis: Akbar Hassanzadeh

Wrote the paper and made revisions: Sheida Moradpour and Hossein Shahnazi

Reviewing the manuscript critically: Hossein Shahnazi

The final version of the manuscript has been read and approved by all the authors, and the requirements for authorship have been met.

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Figures

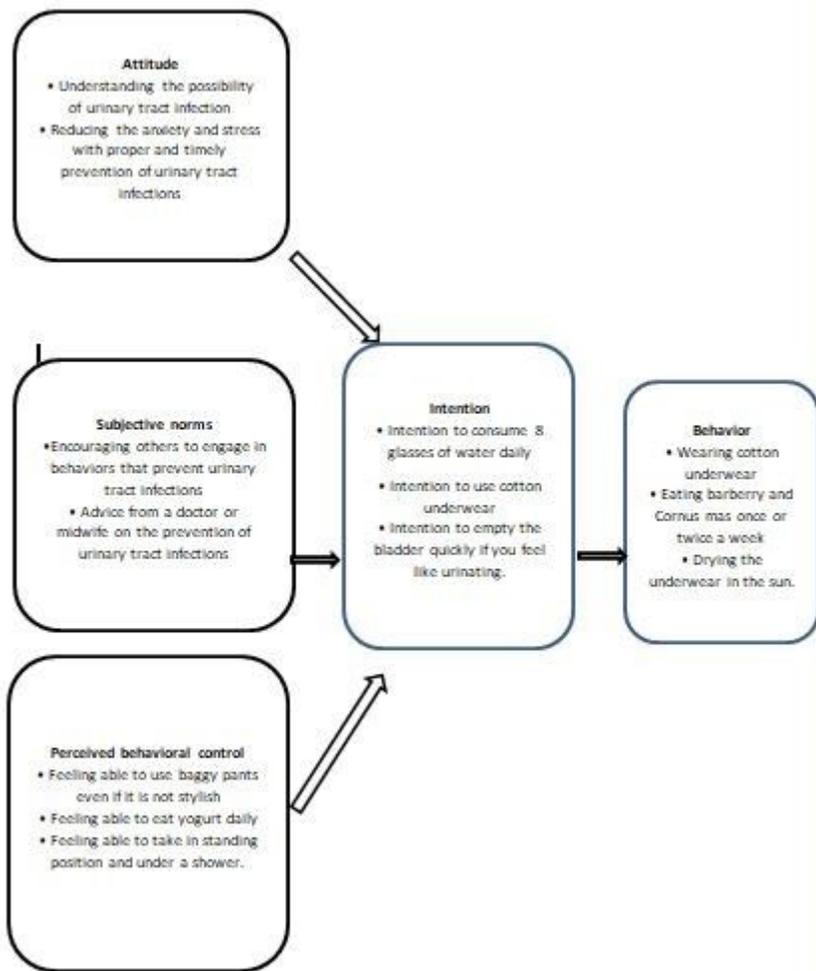


Figure 1

Conceptual framework of the study based on the theory of planned behavior