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Health Education Program Regarding Urinary Tract Infection among Adolescent Girls

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Abstract:
Background: Urinary tract infection, which are thought to be the second most frequent illness affecting people from childhood to old age and are primarily found in females, are currently the biggest public health issue in terms of morbidity and financial cost. **Aim:** To evaluate the effect of the health education program regarding urinary tract infection prevalence, knowledge and self-reported practices among adolescent girls at Assiut City. **Subjects and Method; Study design:** Quasi-experimental pre/posttest research design. **Setting:** Four preparatory schools was selected. **Sample:** 354 adolescent girls. **Tools:** Eight components made up a structured interview questionnaire: Sociodemographic data, body mass index, medical history, self-reported symptoms, nutritional habits, health hygienic practices, prevalence of urinary tract infection, and knowledge of urinary tract infection pre and post the educational program. **Results:** It was found that 28% of adolescent girls are infected with urinary tract infection, 68% complained from flank pain as the most symptoms. There was an association between urinary tract infection and mother education, father occupation, body mass index, presence of chronic disease and social class. Also, 89.3% had poor knowledge pre the intervention with significant improvement after the application of the health education program, 63.8% had improper reported hygienic practices and 71% had unsatisfactory reported nutritional health habits. **Conclusion:** The health education program related to urinary tract infection was effective among the adolescent girls to improve their knowledge. **Recommendations:** Continuous health education programs for adolescent girls about prevention of urinary tract infection are very essential.

Keywords: Adolescent girls, Health education program & Urinary Tract Infection.

Introduction
In underdeveloped nations, Urinary Tract Infection (UTIs) pose a serious threat to public health, especially for teenage girls. Hormonal fluctuations, dehydration, irregular urination, poor menstrual hygiene, and structural abnormalities are all associated with this increased risk. The use of public toilets, which are frequent causes of bacterial infections, is a significant cause of UTIs **(Raj et al., 2020)**.

Around 150 million UTIs are recorded globally each year, making it a major source of sickness, particularly for adolescent girls. It contributes to healthcare costs and is the second most common cause of hospital visits. In addition to having an impact on physical health, UTIs can reduce quality of life, cause absenteeism from school, and place a significant strain on public health systems **(Semwal & Sharma, 2020 & Al Youssef et al., 2020)**.

Exposure to unsanitary bathrooms, which are home to a variety of bacteria, is the main cause of UTIs. 80–85% of cases are caused by Escherichia coli (E. coli), and 5–10% is caused by Staphylococcus **(Sequera, et al., 2021)**. Due to the proximity of bacterial sources, such as the vagina and anus, to the urine opening, women are 50% more prone than men to get bladder infections **(Bazzaz et al., 2021)**.

The prevalence of UTIs is influenced by several established risk factors, such as age, personal& family history of UTIs, and underlying medical conditions. Furthermore, earlier studies have indicated a possible connection between the incidence of UTIs and Body Mass Index (BMI) **(Klein, & Hultgren, 2020)**.

Age and the location of the infection determine the symptoms of a UTIs, which typically include fever, burning when urinating, lower abdomen pain, itching, vaginal and suprapubic pain, and pyuria **(Al Youssef et al., 2020 & Nofal, et al., 2020)**. Three key criteria must be met for the diagnosis: laboratory confirmation of pyuria and bacteriuria, nonspecific infection symptoms without signs of another infection source, and the presence of symptoms unique to the urinary tract. Serious consequences like irreversible kidney damage, bacterial endocarditis, and infertility can result from a delayed diagnosis and treatment of UTIs **(Sequera, et al., 2021)**.

Monroy-Torres &Medina-Jiménez, (2019) refereed to that there are several nutrients have been associated with better urinary health, mainly vitamin C,

probiotics and flavonoids, some studies have shown that frequent consumption of yogurt with probiotics and fruit juices rich in vitamin C decrease the recurrence of UTIs in female. As well as **Ahmadi et al., (2020)** confirmed that UTIs in female students was associated with factors such as daily low intake of water and improper dietary habits.

The adolescent girl can practice many of the precautionary measures to prevent UTIs such as: Taking showers & avoid prolonged baths, wash the perineum from front to back, do not hold urine for long period, wearing underwear made of non-breathing material and drink plenty of water (**Sharmila et al., 2025).**

It is crucial to fulfil the educational need in order to maximize the quality of life, and adolescents can share what they learn with their friends, family, and communities **(Vijayan et al., 2018; Jahan et al., 2020; Eslami et al., 2023)**. Community health nurses and other medical experts assist in early detection through appropriate maintenance and preventative care, which lowers the risk of UTIs **(Mangai et al., 2019)**. They must thus disseminate accurate information on UTIs so that women be aware of the infection's causes, risk factors, symptoms, and preventive measures **(Semwal & Sharma, 2020)**.

Significance of the study:

Acute uncomplicated UTIs are more prevalent among adolescent girls, it is the fourth main reason for outpatient visit among this age group **(Vijayan et al., 2018; Semwal & Sharma, 2020)**. Due to the Egyptian culture, adolescent girls keeping silent about their health issues, there are no precise statistics available at the community level about the frequency of UTIs among adolescent females **(Abdallah et al., 2023)**. It is estimated that 25% of girls visit health clinics annually because of poor hygiene in school restrooms, a lack of appropriate teaching, and unsanitary practices **(Nofal, et al, 2020)**. UTIs are difficult, not only because of the high annual incidence of infections, but also because it's not always easy to be diagnosed. Teenage girls require UTIs integrated health education because some UTIs are asymptomatic or exhibit unusual signs and symptoms. The current study carried out to evaluate the effect of the health education program on promoting knowledge regarding UTIs.

Aim of study:

To evaluate the effect of the health education program regarding urinary tract infection prevalence, knowledge and self-reported practices among adolescent girls at Assiut City.

Specific objectives:

1. To determine the prevalence of UTIs among adolescent girls at Assiut City.
2. To evaluate the effect of the health program on adolescent girls' knowledge related to UTIs at Assiut City.
3. To evaluate the associated variables with UTIs among adolescent girls at Assiut City.

Research hypothesis:

Alternative hypothesis (H1): The health education program related to urinary tract infection is expected to be effective among adolescent girls.

Null hypothesis (H0): The health education program related to urinary tract infection expected to be not effective among adolescent girls.

Subjects and Method:

Research design:

A Quasi-experimental study with one group pre and posttest research design was used in the current research.

Setting:

There are twelve governmental preparatory girls' schools in Assiut City, with six of them located in the east and six in the west. The current study was carried out at four schools that were chosen randomly through closed envelope method; 12 pieces of paper representing the preparatory schools which placed in 12 envelopes; one piece in each envelope, which placed in a box, then one envelope was chosen without any bias.

Sample and sample size estimation:

Multi stage random sampling technique was used in this study; first stage the randomly selected four schools chosen from the total number of schools, the second stage involved the randomly selection of three class from each school representing the different educational grads (first, second and third). The sample size from each school was proportionate to the number of students in the school. Students who meet the inclusion criteria of being aged 12–18 years, free from previous diagnosis with UTIs and agreed to participate in the study were selected by systematic random sampling.

Sample size was calculated using open EPI info 3.01, using prevalence of UTIs 62% as reported by **(Nofal et al., 2020)** confidence level 95%, confidence limit 5%, design effect (1), the calculated sample size was 295 which increased to 354 to safeguard against non-response. Sample size equation

$$\mathbf{n= [DEFF*Np(1-p)]/ [(d^2/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]}$$

Where N=Population size, P=Hypothesized % frequency of outcome factor in the population, d=Confidence limits as 5%, DEFF= Design effect and Z= standard normal deviation. Selected samples from each school were calculated by using the following equation:

$$\frac{\text{The number of students in each school}}{\text{Total number of students in the selected school}} \times \text{estimated sampling size by EPI/info}$$

The following table shows the selected sample from each schools according to student number and based on the above mentioned equation:

School's name	Total number students	Selected sample
Hoda shaarawy	473	107
Um Al-Muminin	265	60
Asmat Afify	279	63
Al-Zahraa	549	124
Total	1566	354

Data collection:

A structure interview questionnaire of eight (8) sections used to collect the study data; section (1): Personal information such name, age, and education level, and Socioeconomic Scale, used to evaluate the socioeconomic level of the students' families. It was divided into four categories: the parents' employment, total monthly income, education level, and family lifestyle. Each item was assigned a score of one. The overall score classified the socioeconomic level into three categories: High between 85–100%, moderate between 60–84%, and low below 60% **(Abd-El-Tawab, 2012 & Osman et al., 2019)**.

Part (2): Included assessment of girls' BMI: Which calculated after measuring weight and height, then divided weight in kg by square height in meter (kg/m2)

The classification was as follows: 1) Underweight: < 18.5 kg/m^2, 2) Normal: 18.5 - 24.99 kg/m^2, 3) Overweight: ≥ 25 kg/m^2 **(Khalaf et al., 2023) (WHO, 2024).**

Part (3): Assessment of the past medical history: Included four (3) questions as: Suffering from chronic disease, name of the disease, and medications taken.

Part (4): Self-reported symptoms of UTIs: Which contained nine (9) questions were asked to assess the presence of UTIs symptoms as: fever, Lower abdominal pain, flank pain, urine spots or drops, dark urine, burning sensation during urination, dysuria, hematouria, and white discharge with foul-smelling urine

Part (5): Reported health hygiene habitual practices of the girls: Which encompassed of (20) closed ended yes or no questions as: Cleaning perineal area, methods & direction of cleaning, dryness of perineal area, going to bathroom when with urgency urination only, wearing underwear made of cotton, using of oils or liquid soap during bathing, using of irritate liquid in the perineal area, , taking shower daily changing of clothes daily, changing of underwear daily, washing hand after touching the perineal area (genital organ), using of aerosol sprayers to clean genital organ, using of swimming pool, exposed the washed under wear to the sun, changing of the sanitary pads every four hours, cleaning of the toilet set before and after using, using of public toilet frequently, voiding at least six time /24 hours, using of clean clothes instead of sanitary pads during menstruation, and using of sanitary pads during menstruation.

Scoring of practice (20 degrees): Each practice scored one degree, and each unhygienic practice scored zero degree. Practice scored as proper or adequate practice ≥ 75% (15-20 degrees) and improper or inadequate practice < 75% (0-14 degrees) **(Nofal, et al., 2020 & Sequera, et al., 2021).**

Part (6): Reported adolescent student girls' nutritional health habits: Which included (21) questions covered nutritional habits as: Drinking a lot of water/day, eating of yoghurt, eating of red meat, eating of spicy foods, drinking of coffee, drinking of soft drinks, eating of food riche fiber, eating a lot of sweets, putting herbs such as garlic in food, drinking of cranberry juice, drinking of cinnamon tea, adding excess spices on food, eating grapes, taking a lot of lemons, eating a lot of orange, eating of spinach, eating of green peppers, eating of broccoli, eating of strawberries, eating of leafy vegetables such as arugula, and eating of fish, or take fish oil supplements.

Scoring system: The response was evaluated by using a three-point likert scale (never, sometimes and always) which scored (0, 1 and 2) simultaneously which reversed in the negative response. Total score determined by summing up and converted into percent; satisfactory practices if the score= ≥ 60% (13-21 degrees) and unsatisfactory practices if the score=< 60% (0-12 degrees) (**Ateya et al., 2016; Y ElRazkey et al., 2017; Sequera et al., 2021; & Khalil et al., 2022**).

Part (7): Screening of UTIs by urine samples analysis: Urine samples were obtained in sterile containers from all the adolescent students' girls. Urine examination was performed to determine the prevalence of UTIs.

Part (8): Students knowledge about UTIs: Was assessed using (14) multiple choices and yes or no questions, which included: Definition of UTIs, causes, risk factors, causative agents, signs & symptoms, urine color in case of infection, abdominal pain in case of infection, types of foods/drinks that exacerbate UTIs symptoms, types of vitamins that prevent UTIs, girls is most susceptible to UTIs, normal color of urine, holding urine for a long time is one of the causes of UTIs, diagnosis and

prevention of UTIs. This part done twice before and after the educational program application.

Scoring of knowledge (Total of 39 degrees):

Each accurate answer scored one degree and wrong answer or didn't know scored zero degrees.

Knowledge total score was classified as: poor= less than 50% (0-19), fair= 50% to less than 75% (20-28) and good= greater than or equal 75% (29-39) **(Saji et al., 2018; Hussein et al., 2021; Kandula et al., 2021; Sequera et al., 2021).**

Validity of the tools:

The converted Arabic tools verified and appraised by five Community Health Nursing and Microbiology & Immunology professors, Faculty of Nursing, and Medicine Assiut University, who look over for implication, completeness and applicability. The questionnaire was changed according to the modifications required.

Reliability of the tools:

The value of Cronbach's alpha reliability test for knowledge was 0.892, for health hygiene habitual practices 0.770 and 0.727 for nutritional health practices.

Operational design:

Ethical considerations:

The study was approved by the Assiut University Faculty of Nursing's Ethical Committee's institutional review board (IRB number is 1120230365). There was no risk to the girls who share in the study. This study complied with common ethical norms for research. The girls who were eager to participate were informed about the purpose and nature of the study, and their oral consent was then obtained. Confidentiality and anonymity were assured. Privacy considerations were considered when collecting data, and study participants were given the choice to withdraw from the study at any time without giving any reason.

Administrative phase:

The Dean of the Assiut University Faculty of Nursing sent a formal letter to the Directorate of Education in Assiut City, granting authorization to conduct the study and outlining its nature and goals.

Pilot study:

10% (35) of girls' students participated in a pilot study to evaluate the tools' readability and clarity. The pilot study's results showed that no adjustments were necessary so the pilot study sample added to the total study sample.

The stages of the health education program:

It was constructed by the researchers according to pertinent research that sought to cover theoretical knowledge base, hygienic and nutritional practices which were related to UTIs. The program included four stages divided as:

Assessment stage:

Following the pre-test results, which indicated deficiencies in knowledge and inadequate dietary and hygienic habits, the program and instructional materials were developed.

Planning stage:

Included setting up the classroom, the sessions, the audiovisual material, the handouts, and other aspects of the program.

Teaching place:

In accordance with the arrangements made with each school's director, the program was held in the libraries, classes or school health nurses' room.

Teaching Time:

The program's starting time was determined by teaching class's schedules at each school and cooperation amongst the researchers and teachers.

Teaching methods and materials:

The researchers employed basic teaching techniques like lectures and group discussions, power point and video. At the conclusion of the program, handouts regarding UTIs were given to each student.

Sessions: The educational program passed through four sessions:

The first session involved:

Orientation, objectives and type of the study, program description, anatomy of urinary tract system, physiology , and preforming pretest. **The second session contained**: Definition of urinary tract infections, signs and symptoms, causes and common risk factors. **The third session covered** diagnosis, treatment and hygienic practices.

The fourth and last session included:

Preventive measures, nutrition and its relationship with UTIs and performance of the post-test.

Implementation stage:

Each group finished the program course in four sessions spread over four days over the six-months program, and one month after the program ended, they took a post-test.

Evaluation stage:

After the program was implemented and finished for one month, a post test was administered to evaluate the educational program related to UTIs among adolescent girls.

Fieldwork:

Data gathered between October 2022 until the end of mid of December 2022. Then started again with the beginning of the second semester until April 2023. The researchers introduced themselves to the participants and gave a brief explanation of the study's objectives and start fill in the questionnaire (pretest) and urine samples were obtained in sterile containers from all the adolescent girls under the supervision of the school nurse in the bathroom then sent to the laboratory. A urine examination was performed to determine the prevalence of UTIs.

Each session of the education program session began with recalling of the previous lesson to gauge the students' knowledge. Depending on the sample size chosen in each school, the study sample was divided into 20 groups with (17-18) students in each group. Data gathered over a six-months on four days/week (Saturday, Sunday, Monday and Tuesday). Depending on the students' responses, each questionnaire took an average of 25 to 30 minutes. Finally, the post-test was done to evaluate the educational program related to UTIs after one month of the program completion.

Statistical analysis:

Data entry and analysis were done using SPSS version 26 (Statistical Package for Social Science). Data were presented as number, percentage, mean and standard deviation. Chi-square test was used to compare qualitative variables. An independent sample t-test was used to compare quantitative variables between two groups and ANOVA test was used for more than two groups. P-value is considered statistically significant when $P < 0.05$.

Results:

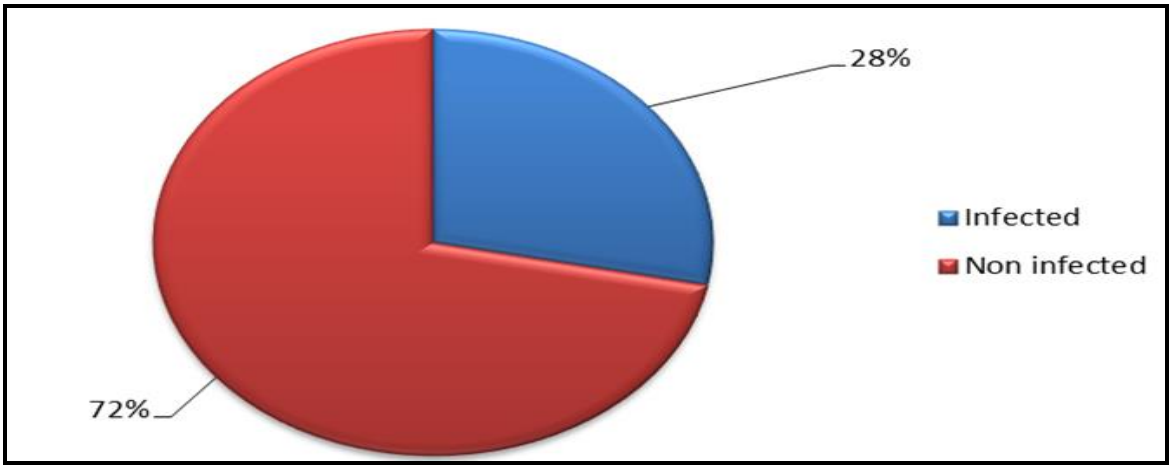


Figure (1): Prevalence of UTIs among adolescent girls in Assiut City (n=354)

Table (1): Socio-demographic characteristics of adolescent girls in relation to their infection with UTIs (n=354)

Variables	Infected with UTIs				P-value
	Yes (n= 100)		No (n= 254)		
	No.	%	No.	%	
Age (years):					
< 14	48	48.0	134	52.8	0.420
≥ 14	52	52.0	120	47.2	
Educational grades:					
First	43	43.0	89	35.0	0.373
Second	26	26.0	73	28.7	
Third	31	31.0	92	36.2	
Mother education:					
Illiterate	16	16.0	11	4.3	0.000*
Primary	7	7.0	8	3.1	
Preparatory	13	13.0	21	8.3	
Secondary	39	39.0	111	43.7	
University/ postgraduate	25	25.0	103	40.6	
Father occupation:					
Unskilled worker	19	19.0	23	9.1	0.006*
Skilled worker	13	13.0	40	15.7	
Employee	56	56.0	177	69.7	
Died	12	12.0	14	5.5	

Variables	Infected with UTIs				P-value
	Yes (n= 100)		No (n= 254)		
	No.	%	No.	%	
Mother occupation:					
Housewife	72	72.0	179	70.5	0.776
Employee	28	28.0	75	29.5	
Place of residence:					
Rural	6	6.0	17	6.7	0.812
Urban	94	94.0	237	93.3	
Social class:					
Low	31	31.0	55	21.7	0.030*
Middle	56	56.0	137	53.9	
High	13	13.0	62	24.4	

Chi-square test *independent samples-t-test*

Table (2): Relation between the reported signs and symptoms of UTIs among the infected and non-infected girls

(#) Reported signs and symptoms	Infected with UTIs				P-value
	Yes (n= 100)		No (n= 254)		
	No.	%	No.	%	
Fever	53	53.0	80	31.5	0.000*
Lower abdominal pain	65	65.0	110	43.3	0.000*
flank pain	68	68.0	132	52.0	0.006*
Urine spots	37	37.0	28	11.0	0.000*
Dark urine	42	42.0	36	14.2	0.000*
Burning during urination	45	45.0	61	24.0	0.000*
Dysuria	32	32.0	33	1s.0	0.000*
Hematuria	27	27.0	22	8.7	0.000*
White secretions	61	61.0	104	40.9	0.001*

(#) More than one answer was selected
Chi-square test

Table (3): Relation between infection with UTIs and BMI & medical history among the adolescent girls (n=354)

Variables	Infected with UTIs				P-value
	Yes (n= 100)		No (n= 254)		
	No.	%	No.	%	
BMI:					
Mean ± SD	27.79 ± 6.35		25.51 ± 4.96		0.000*
Medical history					
Chronic disease:					
Yes	24	24.0	19	7.5	0.000*
No	76	76.0	235	92.5	
(#) **Types of chronic disease:**					
DM	9	37.5	8	42.1	0.189
Chest disease	4	16.7	5	26.3	
Neurological disease	2	8.3	4	21.1	
Kidney disease	9	37.5	2	10.5	
Taking drugs without prescription	41	41.0	70	27.6	0.014*

(#) More than one answer was selected
Chi-square test
independent samples-t-test

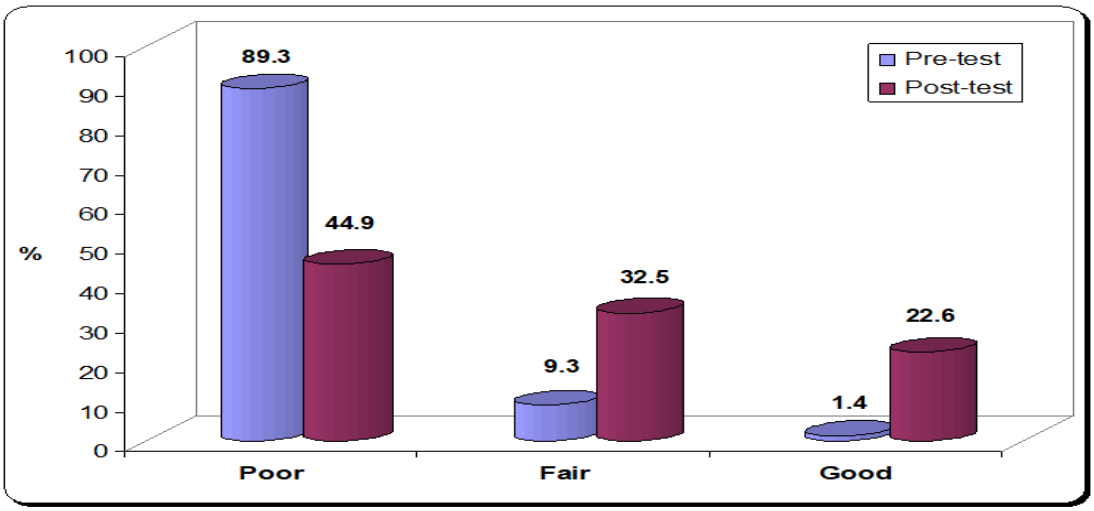


Figure (2): Levels of adolescent girls' knowledge regarding UTIs pre/post the educational program intervention (n=354)

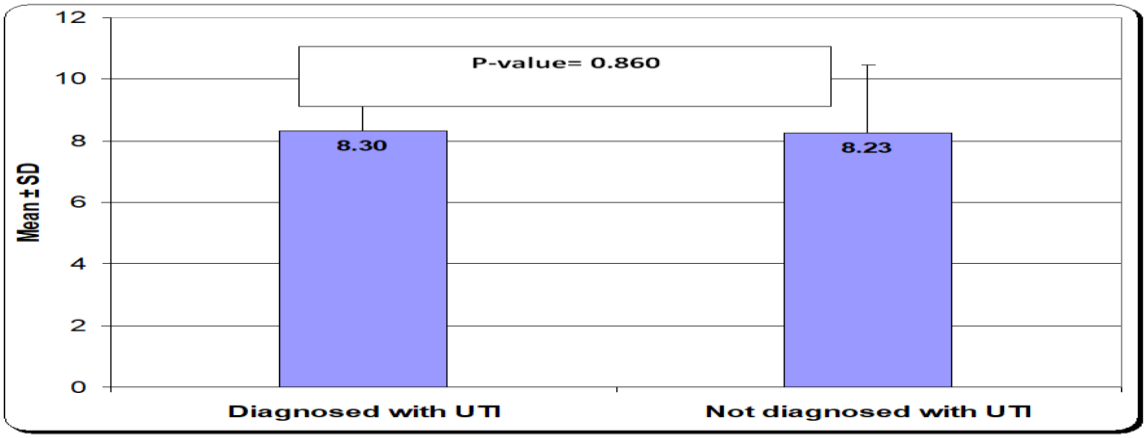
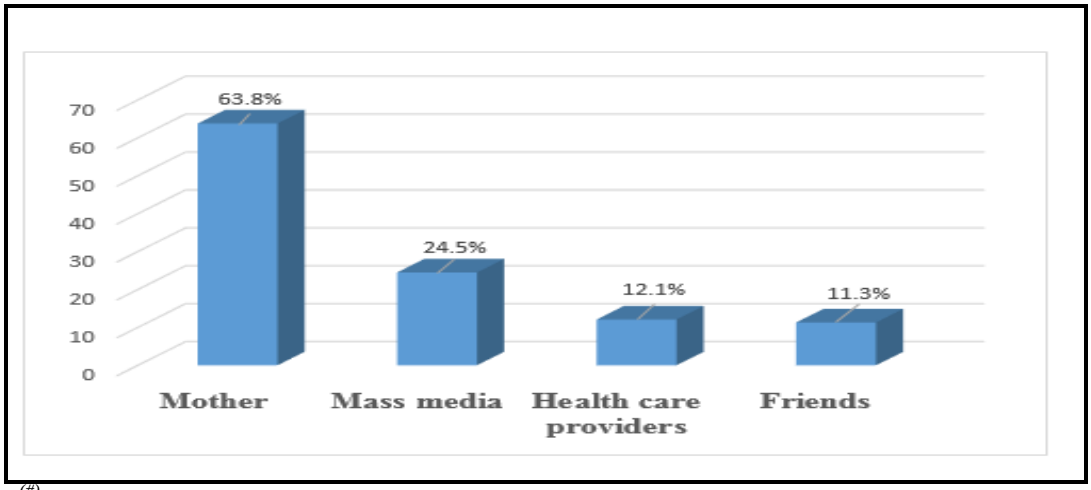


Figure (3): Relation between mean score of knowledge among the infected and non-infected adolescent girls with UTIs (n=354)



(#) *More than one answer was selected*

Figure (4): Sources of knowledge among adolescent girls (n=354)

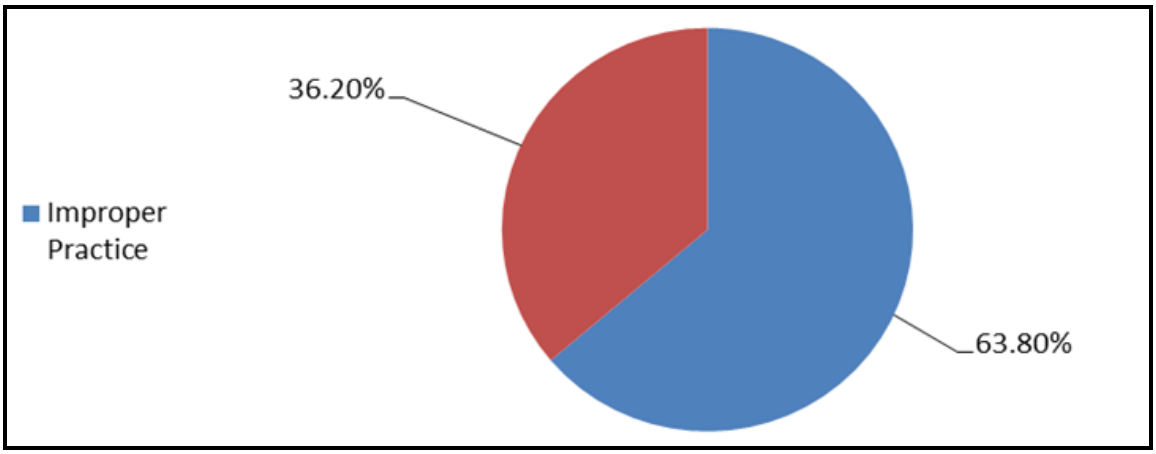


Figure (5): Reported health-related hygienic practices among the adolescent girls (n=354)

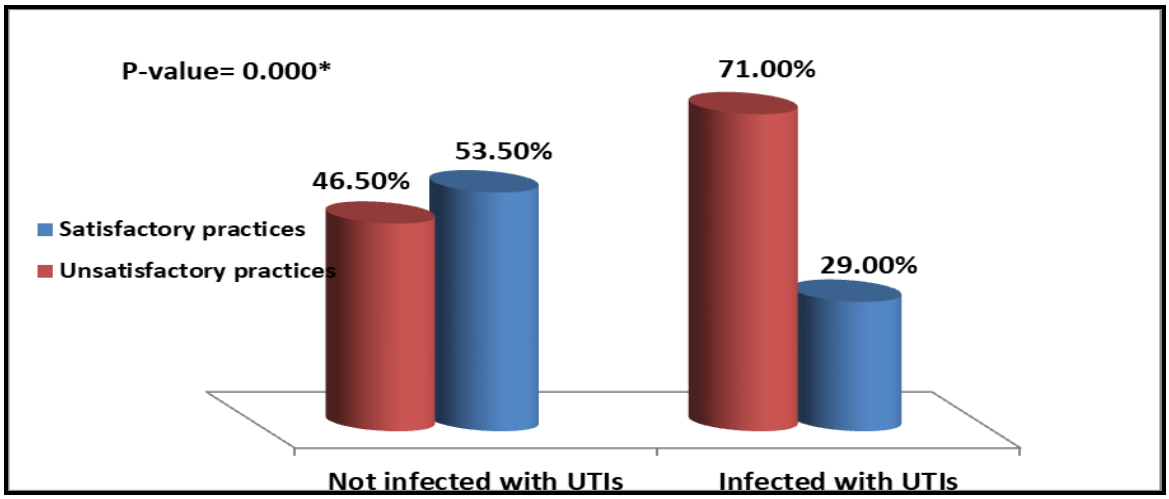


Figure (6): Reported nutritional health habits among infected and non-infected adolescent girls with UTIs (n=354)

Table (4): Relation between mean score of knowledge in pre/post educational intervention and socio-demographic characteristics of the adolescent girls (n=354)

Variables	Mean score of knowledge			
	Pre-test		Post-test	
	Mean ± SD	P-value	Mean ± SD	P-value
Age (years):				
< 14	7.94 ± 3.43	0.063	14.96 ± 5.55	0.000*
≥ 14	8.58 ± 3.02		21.28 ± 6.55	
Educational grades:				
First	7.64 ± 3.41	0.022*	13.44 ± 4.72	0.000*
Second	8.59 ± 3.50		18.18 ± 5.55	
Third	8.64 ± 2.76		22.84 ± 6.33	
Father education:				
Illiterate	6.82 ± 2.40	0.343	14.55 ± 7.50	0.010*
Primary	7.70 ± 2.78		16.84 ± 6.41	
Preparatory	8.17 ± 3.09		17.63 ± 7.30	
Secondary	8.50 ± 3.57		19.19 ± 7.03	
University/ postgraduate	8.88 ± 3.01		19.30 ± 6.83	

Variables	Mean score of knowledge			
	Pre-test	P-value	Post-test	P-value
	Mean ± SD		Mean ± SD	
Mother education:		0.264		0.020*
Illiterate	7.81 ± 2.88		15.13 ± 7.57	
Primary	7.93 ± 3.15		16.86 ± 6.26	
Preparatory	7.32 ± 2.85		17.88 ± 6.88	
Secondary	8.24 ± 3.17		19.04 ± 6.97	
University/ postgraduate	8.64 ± 3.50		19.78 ± 7.15	
Mother occupation:		0.139		0.813
Housewife	8.09 ± 3.14		17.98 ± 7.04	
Employee	8.65 ± 3.49		18.17 ± 6.30	
Place of residence:		0.936		0.893
Rural	8.30 ± 2.88		18.22 ± 7.40	
Urban	8.25 ± 3.28		18.02 ± 6.80	
Social class:		0.375		0.570
Low	7.83 ± 2.71		18.44 ± 7.32	
Middle	8.37 ± 3.49		18.12 ± 6.80	
High	8.43 ± 3.15		17.33 ± 6.33	

Independent samples-t-test *ANOVA test*

Figure (1): Shows that prevalence of UTIs among adolescent girls was 28%.

Table (1): Presents that there was relation between sociodemographic data and infection with UTIs among the studied girls, with presence of significance effect of mother education, father occupation and social class (P-values= 0.000, 0.006, and 0.030). While there wasn't a significant effect of age, educational grades, mother occupation and place of residence (P-values= 0.420, 0.373, 0.776 and 0.812) respectively.

Table (2): Signifies that there were statistically significant differences regarding signs and symptoms of UTIs among adolescent girls with high prevalence of reported signs and symptoms of lower abdominal pain, flank pain, burning sensation during urination and white secretions (P-values= 0.000, 0.006, 0.000 and 0.001) respectively.

Table (3): Reports that there was significant relation between BMI, presence of chronic disease, and taking medications without description with UTIs among the studied girls (P-values=0.000, 0.000 and 0.014) respectively.

Figure (2): Highlights that there was significant improvement in the adolescent girls' levels of knowledge about UTIs that 89.3% of them had poor knowledge in pre-educational intervention which became 44.9% post the educational intervention.

Figure (3): Declares that there wasn't a relation between the mean score of knowledge among UTIs infected and non-infected adolescent girls (P-value= 0.860).

Figure (4): Clarifies that mother was the main source of knowledge of UTIs for 63.8% followed by 24.5% for mass media respectively.

Figure (5): Demonstrates that 63.8% of adolescent girls had improper reported health related hygienic practice.

Figure (6): Clears that 71.0% of the infected adolescent girls were non-vegetarian, while 53.5% of them who were not infected with UTIs were vegetarian with significant difference was found (p-value= 0.000).

Table (4): Represents that there was statistically significant difference between adolescent girls' age, father education and mother's education and UTIs knowledge in post the application of educational intervention(p-value= 0.000, 0.010, 0.020). While the educational grades affected UTIs knowledge in both groups pre/post educational intervention . On the other hand, mothers' occupation, place of residence and social class had no significant effect (p-value= 0. 813 ,0.893,0.570).

Discussion:

Adolescent girls aged 12–16 was selected for the study due to the high global prevalence of UTIs in this age group. Females are more susceptible to UTIs than males, primarily because of the anatomical structure of the female urinary system and its proximity to the reproductive organs. Additionally, the study aimed to evaluate the effect of the health education program regarding urinary tract infection prevalence, knowledge and self-reported practices among adolescent girls at Assiut City. UTIs are

particularly common among female adolescents due to limited hygienic awareness, especially during menstruation, which is often linked to significant morbidity affecting the genital tract.

In the current study, it was found that more than one-fifth of the studied adolescent girls were infected with UTIs. The prevalence rate indicates problem urgency, and several future studies are required to safeguard against its complications. The study findings are in concordance with previous research done by **Salem et al., (2019) & Gebremariam et al., (2019)** who recorded that more than one-fifth of the study groups had UTIs, respectively. **Nofal et al., (2020)** found that UTIs was prevalent among less than two-thirds of the girls. On the other hand, **Ramesh & Sumana., (2019)** who carried out a study on dipstick screening for urinary tract infection in adolescent school girls: evaluation of self-screening ability and found that the prevalence of UTIs among urban and rural adolescent schoolgirls was two-point one percent and three-point eight percent, respectively with an overall prevalence of two-point nine percent. In the same line **Mangai et al., (2019)** recorded that most of the respondents have never experienced urinary tract infections.

The present study throws light on the effect of a health educational program related to UTIs among adolescent girls. In relation to infection with UTIs among adolescent girls it was found that mother education, father occupation and social class had significant effect with P-values= 0.000, 0.006, and 0.030, respectively. While there wasn't significant effect for age, educational grades, mother occupation and place of residence with p-values= 0.420, 0.373, 0.776 and 0.812, respectively. This was not in the same line with **Semwal & Sharma., (2020)**, who conducted a study to estimate the occurrence, knowledge, practice regarding prevention of urinary tract infection among adolescent girls in selected community areas and found that there were no significant associations between occurrences of UTIs with selected baseline demographic variables. This can be attributable to differences between study location.

Regarding the reported signs & symptoms of UTIs, flank pain was the most prevalent followed by lower abdominal pain, white secretions and burning sensation during urination. This is due to almost of the urinary problems first recognized with flank pain This was inconsistent with results reported by **Prasad & Subahani., (2019)** who conducted study in rural part of Chennai to assess the prevalence of urinary tract infection among school going adolescent girls, and reported that the commonest presenting complaint of UTIs in adolescent girls was dysuria. **Al Youssef et al., (2020)** who studied the asymptomatic urinary tract infection among female university students and found that side pain reported by more than one quarter of the sample. Also, **Nofal et al., (2020)** who conducted a study in Zagazig to evaluate the impact of educational program on the level of knowledge and self-care behaviors towards genitourinary tract infection among female adolescent students and **Alshahrani et al., (2022)** who assessed knowledge, attitude and practice of urinary tract infection among female in Aseer Region and reported that burning sensation during urination was the most signs & symptoms among less than two thirds and more than three quarters of the studied female.

The p resented result reported that there was significant relation between the mean of BMI among the infected and non-infected adolescent girls with UTIs. It's well known that obesity decreases immune competence, thus creating an ideal environment for the development of UTIs mainly associated with concomitant diseases. This was in the same line with **Dobner & Kaser., (2018)** who conducted a study to assess the relation between Body mass index and the risk of infection - from underweight to obesity and provided evidence that obesity was associated with development of UTIs. **Strawn et al., (2020)** carried out a prospective study to assess the association of body mass index and contamination of urinalysis samples concluded that obesity was significantly associated with UTIs. On the same direction **Alhabeeb et al., (2021)** who asses the association between body mass index and urinary tract infection and recognized a significant relation between BMI and the incidence of UTIs in obese vs. non-obese subjects, as well as in females.

Furthermore, a statistically significant difference (p-value = 0.007) was observed in the mean score of reported nutritional practices between the girls with UTIs and those without the infection. Dietary recommendations may be a first step in preventing recurrent UTIs in women in the reproductive age, as appear to be a significant risk factor. Consuming a lot of fresh juice, particularly berry juice, is one of several dietary factors linked to a lower risk of UTIs. Berries may therefore have an even stronger anti-UTIs impact than intervention trials revealed. Probiotic-containing fermented milk products also seemed to be linked to a decreased risk of UTIs. **Prasad & Subahani., (2019)** found a strong association between UTIs and improper nutritional practice.

The proposed findings reported that more than one-fifth of the infected girls with UTIs were having chronic diseases. It will know that chronic diseases have negative impact on the immune system and increase the risk of infection. This wasn't agreed with **Salem et al., (2019)** who studied the effect of eating

red meat on symptomatic lower urinary tract infection among female students at King Abdul-Aziz University, Saudi Arabia, found that there wasn't prevalence of chronic diseases among UTIs infected and non-infected students. Also, **Al Youssef et al., (2020)** found that only seven-point six percent were having chronic disease.

Moreover, the presented results reported that slightly more than two-fifths of the infected girls with UTIs were taking drugs without prescription. It can be explained by that taking medication without medical prescriptions especially antibiotics weaken the immune system and increasing the risk of infection. This was disagreed with **Gebremariam et al., (2019)** who conducted a study among students of Mekelle University, northern Ethiopia about the bacteriological profile, risk factors and antimicrobial susceptibility patterns of symptomatic urinary tract infection, and reported that there was no relation between taking drugs and development of UTIs. While, **Al Youssef et al., (2020)** who observed that thirteen-point six percent and sixteen-point percent among the studied sample take drugs without doctor prescription.

The current results revealed that there was significant improvement in the adolescent girls' levels of knowledge about UTIs, that most of them were had poor knowledge in pre-intervention which decreased to more than two fifths post the educational program. Hence the research alternative hypothesis is accepted. Female adolescent students in this stage need continuous educational campaign to increase the durability because their knowledge and good practices decrease overtime. **Al-Kotb et al., (2016)** who conducted a quasi-experimental study in Egypt for prevention of genitourinary tract infection among female adolescents' students, revealed a general pattern of improved knowledge and hygienic practices related to habit score level after program implementation. **Ahmed & Khresheh., (2016)** conducted a study about the impact of instructional program about prevention of UTIs recurrence on the level of knowledge and self-care behaviors among women with UTIs in Saudi Arabia, found that the majority lacked the essential knowledge regarding UTIs with improvement after intervention. Similarly, **Vijayan et al., (2018)** who conducted an interventional study on knowledge, attitude & practice towards urinary tract infection among adolescent girls' students in selected girls' schools in Chitradurga City found that there was improvement of the knowledge level after intervention. The same reported by **Saji et al., (2018)** who studied the effectiveness of structured teaching program on prevention of UTI among adolescent girls this was aligned with the results of **Ahmadi et al., (2020)** who conducted a study about the effect of educational intervention program.

In the same line, the findings of **Moradpour et al., (2020)** who assess the effect of theory of planned behavior-based education in adopting the urinary tract infection prevention behavior in pregnant women**, Budhe., (2020)** who performed a study to assess the effectiveness of structured teaching program on knowledge regarding urinary tract infection among adolescent girls in junior college and **Netali et al., (2021)** who conducted a quasi-experimental study in selected schools of shimla to assess the effectiveness of structured teaching program on knowledge and expressed practices regarding menstrual hygiene among adolescent girls, found that there was positive effect of the educational intervention.

Also, **Kandula et al., (2021)** who confirmed on the efficacy of video educational program on interception of urinary tract infection and neurological stress among teenage girls. As well as, **Muthukumaran., (2023)** who conducted research to assess the effectiveness of structured teaching program on knowledge regarding prevention of urinary tract infection among nursing students of Vivekananda College of Nursing and **Khatri., (2024)** who carried study about the effectiveness of structured teaching program on knowledge regarding prevention of urinary tract infection among the adolescence girls recorded that the results of the study showed that educational intervention was effective.

Nevertheless, this result was opposite with **Selamat et al., (2020)** who assessed the awareness, knowledge & attitude on urinary tract infection among government secondary school students in Malaysia and **Abdallah et al., (2023)**, who studied the prevention of urogenital tract infection among nursing and non-nursing female school students found that the general level of knowledge on UTIs was moderate in pre-educational intervention.

It was noticed from the current findings that mothers were the main source of knowledge of UTIs for more than half of the girls. It well known that mothers are the most trusted source of information for girls especially regarding this confidential issue. This was congruent with **Abdallah et al., (2023)** who reported that family member was the source of UTIs information. This result was not supported by **Semwal & Sharma., (2020)** who reported that the main sources for UTIs information were teachers for most adolescent girls.

The current results showed that there wasn't a relation between the mean score of knowledge among the UTIs infected and non-infected adolescent girls p-value= 0.860. Further, it could be interpreted that the adolescent girls were on the same educational status, so they were lacking knowledge of UTIs prevention.

This was agreed with **Alshahrani et al., (2022)** who found that there wasn't significant relation with p-value= 0.264. This wasn't supported by **Semwal & Sharma., (2020)** who confirmed the presence of relation.

In referral to relation between girls' variables and level of knowledge; it was recorded that there was significant effect of adolescent girls age, father education and mothers' education on their UTIs knowledge in post educational intervention. While their educational grades affected UTIs knowledge in both pre/post-intervention. On the other hand, mothers' occupation, place of residence and social class had no significant effect.

On the same line, **Vijayan et al., (2018)** recorded that there was positive relation between girls' educational grades and their level of knowledge pre/post the intervention. **Selamat et al., (2020)** reported that age was found to be statistically significant with knowledge level. **Alshahrani et al., (2022)** reported that there was effect of social class and educational level on knowledge, while there wasn't with residence. Along with **Sherpa et al., (2022)** who studied the adolescent girl's knowledge, attitude and hygienic practice towards preventive measures of urinary tract infection in selected rural areas Sikkim and revealed that there was a significant association between knowledge scores and demographic variables. This was incongruent with **Hussein et al., (2021)** who assessed nursing students' knowledge toward preventive measures of urinary tract infections in Mosul Teaching Hospitals, **Kandula et al., (2021) & Khatri., (2024)** who concluded that there wasn't a relation between girls' measuring variables and their knowledge.

It was found from the current study findings that more than half of the adolescent girls had improper reported health related hygienic practice. This can explain the high prevalence of UTIs because of the absence of healthy and safe practices which leads to risk of infection with UTIs. This observation was at the same line with **Abdallah et al., (2023)** who observed that more than half of the students had unhealthy practices to prevent UTIs.

While this was incongruent with **Mangai et al., (2019)** who conducted study to assess the knowledge and prevention practices of urinary tract infection (UTI) among female students' residence in university of Jos**, Sequera et al., (2021) & Sherpa et al., (2022)** who reported that majority of the students maintained an average level of practice. As well as **Raj et al., (2020)** who assessed the knowledge and self-reported practices regarding prevention of urinary tract infection among adolescents' girls in selected college of Mangalore and **Alshahrani, et al., (2022)** reported that women had satisfactory practice regarding UTIs.

The present results cleared that less than three-quarters of the infected adolescent girls had unsatisfactory reported nutritional health habits; while more than half of the girls who didn't infect with UTIs had satisfactory reported nutritional health habits with significant difference was found p-value= 0.000. This can be attributed to a healthy diet that involves all the nutritional elements and involving drinking a lot of water creates a defense environment against many infections including UTIs.

Also, many nutritional regiments such as vegetarian diets in which people consume predominantly plant foods and with more frequent consumption of vegetables, fruits and nuts than those who non-vegetarians protect from contracting of UTIs. As vegetarian diets comprise abundant phytochemicals, which may contain anti-microbial properties and protect against UTIs. Many studies supported these findings such as **Salem et al., (2019)** reported that there was significant relation between times of eating meat among UTIs infected and non-infected samples studied.Also,**Chen et al., (2020)** who conducted the risk of urinary tract infection in vegetarians and non-vegetarians: a prospective study and concluded that vegetarian diet was associated with sixteen percent lower UTIs hazards.

Strengths and limitations of the study:

The current study provides comprehensive educational program considering all aspects of the risk factors of UTIs that mentioned in the previous research that the current study is shading light on nutritional practices, hygienic behaviors and UTIs related knowledge, which can be considered as strength of the study. This is self-reported answers from the adolescent girls this must be taken into consideration for generalization of these obtained findings.

Conclusion:

The present study confirmed the acceptance of the study alternative hypothesis by significant enhancement of knowledge level after the education program implementation, with the effect of age, educational grade and father & mother education. There was a relation between the development of UTIs and BMI and nutritional habits were playing a role in infection and there were improper practices of UTIs prevention. So, the study concluded that the health educational program related to urinary tract infection was effective among adolescent girls.

Recommendations:

1. Screen for early detection of UTIs among adolescent girls through periodical urine analysis is recommended.

2. Educate the adolescent girls who diagnoised with UTIs about the importance of adherence with proper treatment to avoid adverse complication of UTIs.
3. Conduction of continuous health education programs for adolescent girls with special focus on nutritional role in prevention of UTIs is advised.
4. Equip the schools' library with the essenital educational materials about UTIs such as brochures, handouts and booklets.
5. Carry out further studies by using different methodology for sample size and settings to help in generalization of the study results.

Conflict of interest:

The authors declared that there was no conflict of interest concerning the publication.

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