

Empowering Young Women Through Education: Effectiveness of a Planned Teaching Program on Urinary Tract Infection Prevention Among Non-Medical Female Students

Jennifer Irom¹, David Ratna Paul Talagathoti^{2*}, Anamika Charan³, Rizu Negi⁴

¹MSc Nursing, Sharda School of Nursing Science and Research, Sharda University, Up.

jenniferirom00@gmail.com

^{2*}Associate Professor, Sharda School of Nursing Science and Research, Sharda University, Up.

davidratnapaul@gmail.com

³Associate Professor, Sharda School of Nursing Science and Research, Sharda University, Up.

anamika.charan@sharda.ac.in

⁴Associate Professor, Sharda School of Nursing Science and Research, Sharda University, Up.

anamika.charan@sharda.ac.in

Corresponding: Dr. T. David Ratna Paul, davidratnapaul@gmail.com

Abstract

Background: Urinary tract infections (UTIs) are common among women, with young female students at higher risk due to limited awareness and poor hygiene practices. This study aimed to assess the effectiveness of a Planned Teaching Program in improving knowledge and attitudes toward UTI prevention among non-medical female students. **Methods:** A quasi-experimental design with non-equivalent control groups was used, involving 100 participants selected via convenience sampling. Data collection utilized a structured knowledge questionnaire and Likert-scale attitude tool, administered pre- and post-intervention. The experimental group underwent a structured one-month teaching program, while the control group received no intervention.

Results: The study evaluated a Planned Teaching Program's effectiveness on UTI prevention among non-medical female students (N = 100). In the experimental group, knowledge scores increased from 5.60 (SD = 2.34) to 15.88 (SD = 1.42), and attitude scores from 31.66 (SD = 7.99) to 46.88 (SD = 13.02) ($p < 0.01$).

Conclusion: The study concluded that the teaching intervention was effective in enhancing awareness and promoting favorable attitudes toward UTI prevention. These findings support the inclusion of targeted health education in non-medical academic settings to encourage preventive health behaviors.

Keywords: adolescent hygiene, health promotion, infection prevention, personal care, women's education

INTRODUCTION

Urinary tract infections (UTIs) represent a significant public health issue worldwide, particularly affecting women due to anatomical and physiological factors. The infection primarily involves the bladder, urethra, ureters, and kidneys, with *Escherichia coli* being the predominant causative agent. While UTIs are often considered benign, recurrent infections can lead to severe complications, including renal damage and systemic infections, especially in young and sexually active females.

Urinary tract infection (UTI) refers to the presence of microbial pathogens in the urinary system, commonly caused by bacteria entering through the urethra. The body defends against UTIs through mechanisms such as tightly closed urethral muscles, the antibacterial properties of urine (low pH, high urea, and osmolality), mucosal proteins that block bacterial adhesion, and the flushing effect of regular urination.[1,2] UTIs can affect any part of the urinary tract and are a major public health concern due to their prevalence and economic burden. The most common type is cystitis (bladder infection), while other forms include pyelonephritis (kidneys), prostatitis (prostate), urethritis (urethra), and bacteriuria (bacteria in the urine).

The urinary system, or renal system, eliminates waste and maintains fluid and salt balance. It includes the kidneys, ureters, bladder, urethra, sphincter muscles, and the prostate (in men). The kidneys filter waste and excess water to form urine, which travels through the ureters to the bladder. The bladder stores urine and expels it when full. The urethra carries urine out of the body, and in men, the prostate adds fluid to semen.

Urinary tract infections (UTIs) are among the most prevalent bacterial infections across all age groups. [3,4] In India, they rank as the third leading cause of hospital admissions. Globally, around 6 million

cases are reported each year, with approximately 30,000 requiring hospitalization. [5] UTIs account for up to 35% of hospital-acquired infections and are the second most common cause of bacteraemia in hospitalized patients. [6,7] They range from uncomplicated to complicated infections, the latter often involving structural or functional abnormalities. UTIs can be first-time or recurrent, with recurrent cases classified as unresolved bacteriuria, persistent infection, or reinfection. While symptoms such as pain, fever, and discomfort are common, complications can occur if the infection reaches the kidneys. [8]

UTIs are particularly common among women, affecting one in five during their lifetime. [9] Though less frequent in men under 50, UTIs in this group are more likely to be associated with complications such as kidney stones or an enlarged prostate. Around 20% of women with one UTI will experience a recurrence; of these, 30% will have a third episode, and 80% of that group will face further recurrences largely due to antibiotic resistance.[10]

Common symptoms of UTI include frequent and urgent urination, painful urination, a persistent urge to urinate, suprapubic pain, and lower back pain. Bladder inflammation reduces its capacity, causing discomfort even with small urine volumes, leading to frequency and urgency—often occurring together. Painful urination, marked by burning or discomfort, results from infection in the urinary tract. Suprapubic pain, felt above the pubic bone, may stem from muscle spasms, while back pain can signal a more serious kidney infection. [11,12]

Despite this, most existing interventions target medical or clinical populations. Non-medical female students, who may lack fundamental understanding of health and disease processes, remain underserved in terms of health education. This gap indicates a scientific vacuum in understanding the effectiveness of educational programs tailored to this specific group.

Additionally, limited studies explore the association between sociodemographic variables (like family income or source of health information) and UTI knowledge and attitude. There is also a paucity of research evaluating behavioral outcomes following structured teaching interventions in university settings in India, particularly in North Indian educational institutions.

Given the growing concern about antimicrobial resistance and the recurrence of UTIs among young women, targeted preventive strategies through educational programs are increasingly relevant. Such interventions empower individuals to adopt health-promoting behaviors, reducing the overall disease burden and improving quality of life.

Importance of Health Education in UTI Prevention

Health education has proven highly effective in reducing the incidence and recurrence of UTIs by promoting self-care behaviors such as hydration, personal hygiene, and timely medical attention. Structured educational interventions have been shown to significantly improve knowledge and attitudes toward UTI prevention, empowering individuals to adopt preventive strategies and avoid risky behaviors [13].

Without targeted education, non-medical students may remain reliant on myths, lack awareness of risk factors, and delay seeking care—factors that elevate both infection rates and recurrence. Comprehensive health education bridges this knowledge gap, encouraging practices that not only improve personal health but also reduce healthcare burdens due to complications and antibiotic resistance [14].

Implementing structured teaching programs in colleges and schools is essential for several reasons:

- Educating students on UTI causes, symptoms, and prevention counters myths and promotes accurate understanding.
- Teaching simple habits—proper cleaning, hydration, and safe toilet use—can significantly reduce infection risk.
- Awareness of early symptoms (e.g., burning urination, urgency) supports prompt treatment and prevents complications.
- Informing students about proper antibiotic use helps reduce self-medication and resistance.
- Knowledge enables better decisions on hygiene, hydration, sexual health, and when to seek care.
- Open discussions reduce stigma and build a campus environment that supports preventive health.
- Education instills lifelong habits, lowers healthcare costs, and boosts community well-being.

Gaps in Research and Development

Despite growing awareness of urinary tract infections (UTIs), several significant gaps remain in the research and development landscape, particularly concerning non-medical student populations.

There is a scarcity of population-specific studies addressing UTI risk and prevention among non-medical, adolescent, or university students. Existing research is predominantly focused on clinical groups, leaving knowledge deficits concerning the unique experiences, behaviors, and needs of young

adults outside health-related fields. Understanding of preventive practices among non-medical students is also limited. There is inadequate exploration of how behavioral and socio-environmental factors—such as hostel living conditions and access to proper hygiene facilities—influence UTI risk. These variations can meaningfully impact infection rates but are rarely accounted for in the literature. [15]

Clinical guidelines for UTI prevention and management often lack consistency, with few developed from robust, longitudinal studies. This inconsistency can lead to varied and sometimes suboptimal recommendations for UTI management and preventive care, especially in educational settings. [16] Although health education is recognized as vital, there is insufficient evidence to determine which types of educational interventions—regarding content, delivery methods, and duration—are most effective for non-medical young adults. The lack of standardized, well-evaluated interventions limits the ability to replicate or scale up successful programs. [17]

Most educational interventions and studies assess only the short-term impact on knowledge or behavior change; the long-term sustainability of these gains remains underexplored. As a result, it is unclear whether positive outcomes persist over time or translate into lasting reductions in UTI incidence.

Finally, there is a continuing need for research into antibiotic stewardship in this demographic. Non-medical students are especially prone to self-medication and inconsistent healthcare access, which can fuel inappropriate antibiotic use and resistance. More targeted studies and interventions are needed to promote responsible antibiotic practices and address the growing challenge of antimicrobial resistance in these vulnerable groups [18].

The persistent gaps in research and development, particularly among non-medical student populations, highlight the necessity of this study. Limited attention has been given to the unique risk factors, preventive behaviors, and health education needs of non-medical female students, resulting in inadequate knowledge, inconsistent preventive practices, and potential for inappropriate antibiotic use. Building on these identified gaps, the purpose of this study is to assess the effectiveness of a structured teaching program in improving knowledge and attitudes regarding urinary tract infection prevention among non-medical female students. By focusing on an underrepresented population and employing evidence-based educational strategies, this research aims to support sustainable improvements in self-care, health literacy, and overall well-being. Such work is crucial for informing policy, guiding curriculum development, and shaping future interventions that address both immediate and long-term public health needs.

METHODOLOGY

This study was conducted at Sharda University, Greater Noida, Uttar Pradesh, specifically within the Sharda School of Humanities and Social Sciences, the Sharda School of Basic Sciences and Research, and the Sharda School of Business Studies. The setting was selected based on feasibility, accessibility of participants, cost-effectiveness, cooperation from the institution, and interest from the researcher.

In this research, a quantitative research approach was adopted to evaluate the effectiveness of a planned teaching program on the prevention of urinary tract infections (UTIs). The research design used was a quasi-experimental, non-equivalent control group design, allowing for comparison between an experimental group receiving the intervention and a control group without intervention.

The target population included all non-medical females enrolled in the selected schools of Sharda University. The accessible population consisted of those who met the inclusion criteria and were present at the time of data collection. A total of 100 participants were selected using convenient sampling, with 50 assigned to the experimental group and 50 to the control group.

The **inclusion criteria** were:

- Female students from the selected non-medical schools,
- No prior formal education on UTI prevention, and
- Willingness to participate.

Exclusion criteria included male students and those unwilling to participate.

The **study variables** included:

- Independent variable: the planned teaching program on UTI prevention.
- Dependent variables: knowledge and attitude scores regarding UTI prevention.

The **data collection instruments** comprised three sections:

1. **Section A:** Socio-demographic data, including age, school, year of study, family income, religion, social background, comfort in discussing health issues, physical activity, and UTI history.

2. **Section B:** A self-structured knowledge questionnaire containing 20 multiple-choice questions (MCQs) covering UTI symptoms, causes, risk factors, diagnosis, treatment, and prevention. Scores were categorized as Poor (1–5), Average (6–10), Adequate (11–15), and Good (16–20). Participants scoring 16–20 were excluded.

3. **Section C:** A self-structured Likert scale with 15 statements evaluating attitudes toward UTI prevention. Scores were classified as Unfavourable (1–25), Neutral (26–50), and Favourable (51–75), with those scoring 51–75 excluded.

Validation and reliability of tools were ensured:

- Content validity was verified by a panel of nine experts (two doctors and seven nursing faculty members), with their suggestions incorporated.
- Reliability was assessed using the test-retest method on 20 students, with Karl Pearson's correlation coefficient yielding $r = 0.84$ for knowledge and $r = 0.81$ for attitude scales, indicating strong reliability.

Intervention for the experimental group was delivered over one month through weekly one-hour sessions using lectures, audiovisual aids, discussions, case studies, quizzes, and community engagement. The control group received no intervention.

Ethical clearance was obtained from the Institutional Ethics Committee of Sharda School of Medical Science and Research (IEC No. SU/SMS&R/76-A/2024/311), and administrative permissions were secured. Undertaking received from all the samples and established the privacy.

Data collection done through pre-tests and post-tests administered to both groups. The pre-test measured baseline knowledge and attitude; the post-test was conducted one week after the final intervention session.

Statistical analysis was performed using SPSS. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize demographic variables and baseline data. Inferential statistics, including t-tests and chi-square tests, were employed to assess the effectiveness of the intervention and examine associations between variables.

RESULTS AND DISCUSSION

The present study evaluated the effectiveness of a planned teaching program on knowledge and attitude regarding urinary tract infection (UTI) prevention among non-medical female students. The majority of participants in both groups were first-year students (98.0% experimental, 74.0% control) and mainly from the School of Humanities and Social Sciences (54.0% experimental, 40.0% control). The average age was similar: 19.68 years (SD = 1.87) in the experimental group and 20.02 years (SD = 1.79) in the control group. Most belonged to urban areas (76.0% experimental, 80.0% control) and identified as Hindu (86.0% and 76.0%, respectively). The most common income category in the experimental group was ₹2,00,000 and above (38.0%), while three categories equally dominated in the control group (28.0% each). Family/friends were the main source of health information (50.0% experimental, 36.0% control). Most participants were comfortable discussing health issues with peers (90.0% experimental, 92.0% control). Occasional physical activity was most reported (42.0% experimental, 46.0% control). A majority had never experienced UTIs (70.0% experimental, 64.0% control).

The findings demonstrated statistically significant improvements in both knowledge and attitude levels following the intervention in the experimental group compared to the control group. At baseline, both experimental and control groups were homogeneous in knowledge and attitude scores ($p > 0.05$), confirming comparability (Table 1).

Table 1: Mean, Standard Deviation and Homogeneity Comparison of Outcome Variables at Baseline (N=100)

Outcome measure	Experimental Group (n=50)		Control Group (n=50)		Z	p
	Mean	SD	Mean	SD		
Knowledge	5.60	2.34	5.34	2.72	-0.63	0.52
Attitude	31.66	7.99	32.12	9.35	-0.05	0.95

Effectiveness of the Planned Teaching Program on Knowledge Regarding UTI Prevention:

The effectiveness of the Planned Teaching Program was evaluated by comparing pre and post intervention knowledge scores among non-medical females in both the experimental and control groups.

Within the experimental group, the mean knowledge score significantly increased from 5.60 (SD = 2.34) in the pre-test to 15.88 (SD = 1.42) in the post-test. The calculated Z-value was 6.93 with a p-value < 0.01, indicating a statistically significant improvement in knowledge following the intervention. These findings confirm that the Planned Teaching Program was highly effective in enhancing students' knowledge about urinary tract infection (UTI) prevention. In contrast, the control group, which did not receive the intervention, showed only a marginal increase in knowledge scores—from 5.34 (SD = 2.72) to 5.64 (SD = 2.50). The Z-value was 1.38 with a p-value of 0.16, suggesting change was not statistically significant. This indicates that, without the teaching intervention, there was no meaningful improvement in knowledge levels.

When comparing knowledge gain between the two groups, the experimental group demonstrated a mean difference of 10.28 (SD = 0.92) from pre-test to post-test, while the control group showed a mean difference of only 0.30 (SD = 0.58). The Z-value for this comparison was 5.73 with a p-value < 0.01, highlighting a highly significant difference between the groups.

These results clearly demonstrate the substantial effectiveness of the Planned Teaching Program in improving knowledge regarding UTI prevention among non-medical female students.

Table 2. Effectiveness of Planned Teaching Program on Knowledge towards UTI among non-medial female students.

Knowledge Levels towards UTI	Experimental Group Mean and SD	Control Group Mean and SD	Z**	P
Pre-Test	5.6 (2.34)	5.34 (2.72)	5.73	<0.01
Post-Test	15.88 (1.42)	5.64 (2.50)		
Z*	6.93	1.38		
P	<0.01	0.16		

z* - Wilcoxon Test; z** - Mann-Whitney Test

Effectiveness of the Planned Teaching Program on Attitude Toward UTI Prevention

The effectiveness of the Planned Teaching Program in improving attitudes toward urinary tract infection (UTI) prevention was assessed by comparing pre- and post-test scores within and between the experimental and control groups.

The experimental group's mean attitude score rose from 31.66 ± 7.99 to 46.88 ± 13.02; the Wilcoxon signed-rank test (Z = 6.49, p < 0.01) confirmed a significant improvement. In contrast, the control group showed virtually no change (32.12 ± 9.36 to 31.84 ± 9.28; Z = 1.31, p = 0.18). A Mann-Whitney U test (Z = 8.65, p < 0.01) further verified the intervention's superior impact. Overall, the Planned Teaching Program markedly enhanced students' attitudes toward UTI prevention.

Table 3. Effectiveness of Planned Teaching Program on Attitude towards UTI among non-medial female students

Attitude Levels towards UTI	Experimental Group Mean and SD	Control Group Mean and SD	Z**	P
Pre-Test	31.66 (7.99)	32.12 (9.36)	8.65	< 0.01
Post-Test	46.88 (13.02)	31.84 (9.28)		
Z*	6.49	1.31		
P	<0.01	0.18		

z* - Wilcoxon Test; z** - Mann-Whitney Test

DISCUSSION

This study demonstrated that a structured Planned Teaching Program significantly enhanced knowledge and attitudes toward UTI prevention among non-medical female students. The experimental group showed marked improvement compared to controls, confirming the intervention's effectiveness in addressing critical gaps in adolescent health education. These findings align with research indicating that educational interventions targeting hygiene practices reduce UTI incidence [19].

The observed improvements in both knowledge and attitudes are consistent with previous studies on structured health education programs. Research emphasizes that educational interventions influence not only what students know but also how they perceive health issues [20], with attitude-based education encouraging preventive behaviors, particularly in sensitive areas like urinary health [21].

The significant association between prior UTI experience and higher knowledge levels demonstrates that experiential learning enhances awareness. Students who experienced UTIs showed better retention and application of prevention strategies, supporting theories that direct experience strengthens health education outcomes [22]. However, the unexpected finding that physically active students had poorer baseline knowledge reveals that physical wellness doesn't directly correlate with health literacy regarding infections, highlighting the need for comprehensive educational approaches integrating both physical and preventive health knowledge [23,24].

This research addresses a significant gap by focusing on non-medical female students, a population underrepresented in UTI educational interventions. While medical students possess baseline understanding of infections, non-medical students face higher risks due to limited knowledge and misconceptions. The low-cost, replicable intervention makes it suitable for broader implementation in university health programs. The program's success suggests significant policy implications for integrating reproductive and urinary health education into general curricula, supporting evidence-based educational interventions that enhance self-care and health literacy [25,26].

This study provides strong evidence supporting the effectiveness of structured educational interventions in improving knowledge and attitudes toward UTI prevention among non-medical female students, a group at heightened risk due to lack of formal health education. By demonstrating measurable improvements through a low-cost, scalable program, the findings contribute valuable insights to the field of public health education [27].

The study's originality, practical relevance, and alignment with existing research underscore its scientific merit and real-world applicability. Given the growing emphasis on preventive health and health literacy, especially in resource-limited and academic settings, this research offers timely and actionable recommendations. Its implications for curriculum development, policy formulation, and campus health initiatives make it a strong candidate for publication in journals focused on community health, women's health, nursing education, or preventive medicine.

Strength and Limitations

The strength of this study lies in its focus on a previously underexplored group—non-medical students, who often lack formal education on UTIs. Through a structured teaching program, the study effectively addressed knowledge gaps and promoted awareness of UTI prevention. The well-designed intervention and reliable tools added to the credibility of the findings, while the academic setting highlighted the feasibility of health education in improving young adult health outcomes. However, limitations include the use of convenience sampling and a single-institution scope, which may limit generalizability. Future studies should adopt multi-center, randomized controlled designs with long-term follow-up to assess lasting behavioral impact.

CONCLUSION

This study concludes that a Planned Teaching Program is highly effective in significantly improving knowledge and attitudes toward UTI prevention among non-medical female students. The intervention met its objectives by enhancing participants' understanding and promoting healthier behaviors. These findings support the integration of structured health education into academic settings to advance preventive practices among young women. Future research should target larger, more diverse populations across multiple institutions to validate results and examine long-term behavioral impact. Longitudinal studies are also needed to assess how knowledge and attitude improvements influence actual health outcomes. Overall, the study highlights the value of accessible, targeted health education in non-clinical populations for effective public health planning.

REFERENCES:

1. Wilks D, Farrington M, Rubenstein D. The Infectious Diseases Manual. International ed. Oxford: Blackwell Science Ltd; 1995. p. 58–64. DOI:10.1002/9780470757253
2. Nester EW, Anderson DG, Roberts CE, Pearsall NN, Nester MT. Microbiology: A Human Perspective. International ed. New York: McGraw Hill; 2004. p. 633–4.
3. National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). What I need to know about urinary tract infections. NIH Publication No. 07-4807. Bethesda (MD): U.S. Department of Health and Human Services, National Institutes of Health; 2007 Aug.

4. Chang SL, Shortliffe LD. Pediatric urinary tract infections. *Pediatr Clin North Am*. 2006 Jun;53(3):379-400, vi. doi: 10.1016/j.pcl.2006.02.011. PMID: 16716786.
5. Kucheria R, Dasgupta P, Sacks SH, Khan MS, Sheerin NS. Urinary tract infections: new insights into a common problem. *Postgrad Med J*. 2005 Feb;81(952):83-6. doi: 10.1136/pgmj.2004.023036. PMID: 15701738; PMCID: PMC1743204.
6. Bano K, Khan J, Rifat, Begum H, Munir S, Akbar NU, Ansari JA, Anees M. Patterns of antibiotic sensitivity of bacterial pathogens among urinary tract infections (UTI) patients in a Pakistani population. *Afr J Microbiol Res*. 2012;6(2):414-20. DOI: 10.5897/AJMR11.1171
7. Stamm WE. Scientific and clinical challenges in the management of urinary tract infections. *Am J Med*. 2002 Jul 8;113 Suppl 1A:1S-4S. doi: 10.1016/s0002-9343(02)01053-7. PMID: 12113865.
8. Weinstein MP, Towns ML, Quartey SM, Mirrett S, Reimer LG, Parmigiani G, Reller LB. The clinical significance of positive blood cultures in the 1990s: a prospective comprehensive evaluation of the microbiology, epidemiology, and outcome of bacteremia and fungemia in adults. *Clin Infect Dis*. 1997 Apr;24(4):584-602. doi: 10.1093/clind/24.4.584. PMID: 9145732.
9. Hvidberg H, Struve C, Krogfelt KA, Christensen N, Rasmussen SN, Frimodt-Møller N. Development of a long-term ascending urinary tract infection mouse model for antibiotic treatment studies. *Antimicrob Agents Chemother*. 2000 Jan;44(1):156-63. doi: 10.1128/AAC.44.1.156-163.2000. PMID: 10602738; PMCID: PMC89643..
10. Foxman B. Epidemiology of urinary tract infections: incidence, morbidity, and economic costs. *Am J Med*. 2002 Jul 8;113 Suppl 1A:5S-13S. doi: 10.1016/s0002-9343(02)01054-9. PMID: 12113866.
11. Head KA. Natural approaches to prevention and treatment of infections of the lower urinary tract. *Altern Med Rev*. 2008 Sep;13(3):227-44. PMID: 18950249.
12. Saber MH, Barai L, Haq JA, et al. The pattern of organism causing urinary tract infection in diabetic and non-diabetic patients in Bangladesh. *Bangladesh J Med Microbiol*. 2010;4:6-8. DOI:10.3329/BJMM.V4I1.8461
13. Javaheri Tehrani F, Nikpour S, Haji Kazemi EA, Sanaie N, Shariat Panahi SA. The effect of education based on health belief model on health beliefs of women with urinary tract infection. *Int J Community Based Nurs Midwifery*. 2014 Jan;2(1):2-11. PMID: 25349840; PMCID: PMC4201186.
14. Metwally AI, Abdelaziz AL, Ghalwash MA, Mohamed AK. Effect of self-care practice health educational program for patients on urinary tract infection recurrence. *Tanta Sci Nurs J*. 2021 Nov;23(4):134-159. doi:10.21608/tsnj.2021.208722.
15. Nimmakayala JK, Tulasi JDNS. Prevalence of urinary tract infections among medical and non-medical students: an observational study. *Int J Sci Res*. 2025;14(4):16-17. doi:10.36106/ijsr
16. Jenkins R. Preventing and managing UTIs: many gaps remain in evidence base. *Med Today*. 2024 Dec;25(12):5.
17. Gupta K, Wagenlehner F, Wilcox M, Advani SD, Bilsen M, Bonkat G, Cantón R, Geerlings S, Grabein B, Horcajada JP, Kushner P, Narayanan N, Scheetz M. Urinary tract infection in adults: gaps in current guidelines - opinions from an international multidisciplinary panel and relevance to clinical practice. *BMC Proc*. 2025 Jul 3;19(Suppl 16):18. doi: 10.1186/s12919-025-00333-5. PMID: 40604992; PMCID: PMC12224355.
18. Zimmern P. Gaps in knowledge and recurrent urinary tract infections in women. *Curr Opin Urol*. 2024 Nov 1;34(6):452-463. doi: 10.1097/MOU.0000000000001226. Epub 2024 Sep 13. PMID: 39279346.
19. Almeida da Silva JL, Ribeiro da Silva M, Ramos da Cruz Almeida TH, Aparecida Barbosa D. Educational interventions to prevent urinary infections in institutionalized elderly people. Quasi-experimental Study. *Invest Educ Enferm*. 2024 Mar;42(1):e05. doi: 10.17533/udea.iee.v42n1e05. PMID: 39083817; PMCID: PMC11290905.
20. Alhaj SS, Allami S, Mohamadiyah A, Agha A, Ali AKA, Habbal JMB, Saeed BQ. Knowledge, attitudes, and practices regarding urinary tract infections among women in the United Arab Emirates. *PLoS One*. 2025 Jan 10;20(1):e0298993. doi: 10.1371/journal.pone.0298993. PMID: 39792816; PMCID: PMC11723537.
21. Eslami V, Tavakoly Sany SB, Ghavami V, Peyman N. The Relationship of Health literacy with Preventive Behaviors of Urinary Tract Infection in Pregnant Women. *Journal of Health Literacy*. Winter 2022; 6(4): 22-31
22. Eslami V, Sany SBT, Tehrani H, Ghavami V, Peyman N. Examining health literacy and self-efficacy levels and their association with preventive behaviors of urinary tract infection in Iranian pregnant women: across sectional study. *BMC Womens Health*. 2023 May 12;23(1):258. doi: 10.1186/s12905-023-02359-3. PMID: 37173682; PMCID: PMC10180610.
23. Tar Lim, R. B., Shin Chow, D. W., & Zheng, H. (2023). A Scoping Review of Experiential Learning in Public Health Education From the Perspective of Students, Faculty, and Community Partners. *Journal of Experiential Education*, 47(1), 72-110. <https://doi.org/10.1177/10538259231171073>
24. Yardley S, Teunissen PW, Dornan T. Experiential learning: AMEE Guide No. 63. *Med Teach*. 2012;34(2):e102-15. doi: 10.3109/0142159X.2012.650741. PMID: 22289008.
25. Zangger G, Mortensen SR, Tang LH, Thygesen LC, Skou ST. Association between digital health literacy and physical activity levels among individuals with and without long-term health conditions: Data from a cross-sectional survey of 19,231 individuals. *Digit Health*. 2024 Feb 25;10:20552076241233158. doi: 10.1177/20552076241233158. PMID: 38410789; PMCID: PMC10896057.
26. Jelly P, Verma R, Kumawat R, Choudhary S, Chadha L, Sharma R. Occurrence of urinary tract infection and preventive strategies practiced by female students at a tertiary care teaching institution. *J Educ Health Promot*. 2022 Apr 28;11:122. doi: 10.4103/jehp.jehp_750_21. PMID: 35677263; PMCID: PMC9170194.
27. Almaghlouth AK, Alkhalaf RA, Alshamrani AA, Alibrahim JA, Alhulibi BS, Al-Yousef AY, Alamer AK, Alsuabie SM, Almuhanha SM, Alshehri AD. Awareness, Knowledge, and Attitude Towards Urinary Tract Infections: An Appraisal From Saudi Arabia. *Cureus*. 2023 Nov 24;15(11):e49352. doi: 10.7759/cureus.49352. PMID: 38143625; PMCID: PMC10749182.