

UTILIZATION OF HERBAL PADS TO PREVENT URINARY TRACT INFECTIONS IN WOMEN OF REPRODUCTIVE AGE IN BEJI VILLAGE JUNREJO DISTRICT BATU CITY

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ABSTRACT

Urinary Tract Infection (UTI) is a general term used to indicate the presence of microorganisms in urine. Women at high risk for UTIs are menstruating women. In Indonesia, only a small percentage of women use herbal sanitary napkins during menstruation. Therefore, researchers wanted to explore the effect of herbal sanitary napkin use on UTI incidence by assessing urine profiles as an indicator for UTI diagnosis. The research method used in this study was an intervention study with a crossover design. A formula could not be used to determine the sample size because there had been no previous research. Therefore, a sample size of 30 individuals was selected as a preliminary study. The results of the study showed that 1 research subject had leukocytes >15 after using non-herbal sanitary napkins and negative nitrite based on the results of urinalysis using a urine dipstick test. Conclusion: 1. 1 research subject experienced an increase in the number of leukocytes after using non-herbal sanitary napkins. 2. There was no difference in urinary nitrite after using herbal sanitary napkins compared to non-herbal sanitary napkins.

Keywords: *Infection, herbal pads, women of reproductive age, urinary tract infection, urine dipstick test.*

INTRODUCTION

Urinary Tract Infection (UTI) is a general term used to indicate the presence of microorganisms in urine. The presence of bacteria in urine is called bacteriuria. Bacteriuria indicates the growth of more than 10⁵ colonies of pure microorganisms forming units (CFU) in urine culture (Departemen Kesehatan RI, 2024). Significant bacteriuria without clinical manifestations of UTI is called bacteriuria. asymptomatic. In contrast, significant bacteriuria accompanied by clinical manifestations is called bacteriuria. Symptomatic. Urinary tract infections are divided based on their location, namely the upper and lower urinary tract (Ellora & Putri, 2024).

Every individual is at risk of developing a bacterial infection in their urinary tract, especially adult women. Women at high risk are those menstruating. Menstruation is a trigger for UTIs due to the influence of the endocrine system, specifically the hormone estrogen. This is also supported by the anatomy of the female urinary system, namely the length of the female urethra, which is only around 3-4 cm and its proximity to the reproductive tract, the vaginal opening, and the anus. Therefore, women are at greater risk of experiencing ascending UTIs. infection of the perineum and surrounding area (Sahar, 2025).

UTI remains a significant public health challenge in Indonesia that demands urgent attention. Based on recent national epidemiological data and clinical surveillance reports, the prevalence of UTIs among women of reproductive age in community settings ranges from 15% to 25%, with global figures indicating that more than 50% of women will experience at least one UTI episode during their lifetime. Within the domestic landscape, healthcare reports underscore that lower tract infections constitute one of the most frequent reasons for empirical antibiotic prescription in primary care centers. In specific cohorts, such as adolescents and young women, the incidence significantly rises during transition periods, reaching up to 20% due to lifestyle factors, physiological shifts, and menstrual hygiene vulnerabilities. In children from birth to 1 year of age, bacteriuria is found in 2.7% of boys and 0.7% of girls. In children aged 1-5 years, the incidence is Bacteriuria in women increases to 4.5% while decreasing in men to 0.5%. As adolescence approaches, the incidence of UTIs increases significantly in young women, reaching 20%, while remaining constant in young men (Sahar, 2025).

The use of sanitary napkins during menstruation is also a risk factor for UTIs. Previous research has shown (Sinha S, 2023) that hygienic sanitary napkin use during menstruation is crucial for preventing health problems such as reproductive tract infections, urinary tract infections, and unpleasant odors in the reproductive organs and urinary tract. In addition, (Sinha S, 2023) maintaining hygiene during menstruation is the most important component for women, poor hygiene can cause urinary tract infections, reproductive tract infections, and sexually transmitted diseases such as HIV/AIDS. Feminine sanitary napkins come in two types: herbal and non-herbal. The difference between the two is the natural herbal composition they contain, which not only absorbs menstrual blood but also acts as an antiseptic.

Ellora dan Putri (2024) reference explains several natural herbal ingredients and their functions contained in herbal sanitary napkins. Mai Fang Shi, with the Latin name Maifanitem / Mai Fang Stone / Talcum, is effective in reducing foul odors. This is because this ingredient can prevent the growth of viruses and bacteria. Peppermint, with the Latin name Menthae Herb, functions to reduce pain and provide a cooling sensation to wounds. In addition, the benefits of peppermint in the wound healing process include antibiotics and analgesics. Ming Fang (Alumen), functions as an antiseptic and kills germs in the vagina as well as cleans blood clots in the uterus. Bing Pian, with the Latin name Borneol / Borneolum, is one of the ingredients contained in herbal sanitary napkins that can overcome inflammation, increase epithelial permeability, and suppress bacterial growth. Kuai Mu You, with the Latin name Agrilariae Lignum works to reduce muscle and joint pain, alleviate back and lower back pain, prevent skin diseases, improve blood circulation, and contains phytoncides that help stabilize emotions, especially during menstruation. Furthermore, these herbal pads also contain pure cotton (Gossypium) as the primary absorbent ingredient and do not trigger cervical cancer.

A UTI can be diagnosed with a urine test. This includes a urinalysis and a urine culture. The urinalysis checks for the presence of leukocytes, erythrocytes, or bacteria. A urine culture is intended to determine the presence and type of bacteria, and to determine

the appropriate antibiotic to kill the bacteria causing the infection. Although a urine culture is the gold standard for diagnosing a UTI, its main drawback is that it takes a long time to obtain results, around 3-5 days, and is quite expensive. A UTI itself requires a rapid diagnosis for further management (Sahar, 2025).

In this study, the examination used as an indicator for confirming the diagnosis of UTI was a urine dipstick test. The urine dipstick test is an alternative examination that can be performed before or after obtaining the results of a urine culture. In Indonesia, only a small percentage of women use herbal sanitary napkins during menstruation. The structural and formulation difference between the two lies in the natural active herbal composition integrated into the core matrix. While non-herbal pads merely act as passive absorbents that trap blood—creating a warm, stagnant, and humid microenvironment highly conducive to rapid opportunistic bacterial colonization—herbal sanitary napkins are deliberately formulated with bio-active compounds that serve as continuous localized antiseptics. These natural phytochemicals disrupt bacterial cell membranes, inhibit microbial enzymatic activities, and maintain a balanced perineal micro-climate, thereby preventing the upward migration of pathogens into the urethra (Auliyah et al., 2023).

Explicit clinical trials evaluating the preventative role of natural antiseptic-infused pads against postmenstrual urinary tract colonization remain heavily scarce. This research focused extensively on general menstrual hygiene behaviors or standard gynecological tract infections, leaving a structural gap regarding how pad materials directly modify immediate postmenstrual uropathogenic parameters (Prasetya, 2022). This study directly addresses this gap by evaluating localized biomarker shifts (nitrite and leukocytes) immediately following the menstrual phase. Therefore, this study aims to investigate the effect of herbal sanitary pad use on urinary tract infection indicators among women of reproductive age.

RESEARCH METHOD

To guarantee methodological rigor and eliminate carry-over effects, the crossover sequence allocation was fully randomized using a computer-generated block randomization sequence. Participants were assigned to either Sequence A (Herbal pads in Month 1, followed by Non-Herbal pads in Month 2) or Sequence B (Non-Herbal pads in Month 1, followed by Herbal pads in Month 2), with an enforced 3-week washout period corresponding to the physiological intermenstrual interval.

The entire series of studies was carried out over a period of nine months, starting from August 2025 to April 2026, with the urine sampling stage focused on October 2025 to January 2026. The laboratory analysis process was carried out in two places within the Wira Husada Nusantara Polytechnic environment, including the Microbiology laboratory and the Chemistry laboratory.

The target population in this study were women of childbearing age between the ages of 18 and 25. Meanwhile, the research sample was taken specifically from women of childbearing age in Junrejo Village, Batu City who met the eligibility criteria. The inclusion criteria in this study included women aged 18–25 years, having regular

menstrual cycles, and stating their willingness in writing to participate as research samples. Conversely, subjects would be excluded if they had a history of Urinary Tract Infection (UTI) in the past month, were married, or had a history of using herbal sanitary napkins in the past two months.

Given that research on this topic had never been conducted before, a pilot study was conducted *involving* 30 subjects. This sample size of 30 individuals was deemed sufficient for statistical data analysis and the applicability of the results. The theoretical sample size for this research plan was based on two paired-group mathematical formulations. The first formulation was used to detect differences in mean leukocyte changes:

$$n = \left[\frac{(Z_{\alpha} + Z_{\beta}) \times S_d}{d} \right]^2$$

Where S_d is the standard deviation of the mean difference (*standard deviation of mean difference*) and d is the minimum difference that is considered clinically meaningful (*minimal clinically important difference*). The second formulation was applied to find the difference in the proportion of positive urine nitrite between groups using and not using herbal pads through the formula for the difference in proportion of paired groups, namely: $n_p = \frac{\{Z_{\alpha} + Z_{\beta}\}^2 \times f}{d^2}$ or using the alternative formula:

$$n = \frac{[Z_{\alpha} + Z_{\beta}]^2 \times f}{d^2}$$

Where n_p or n represents the number of subject pairs, f represents the proportion of participant pairs with discordant responses based on the literature or preliminary studies, and d represents the difference in proportions ($P_1 - P_2$). The main diagnostic instruments deployed were sterile, airtight midstream urine collectors and commercially standardized multi-parameter urinalysis dipstick reagent strips. The validity and diagnostic reliability of the urine dipstick strips were calibrated and verified daily using automated quality control solutions to ensure analytical sensitivity for leukocyte esterase and nitrite detection. The biological material evaluated was fresh morning urine in the middle portion (midstream urine). The urine was collected for three consecutive days post-menstruation, specifically on the first, second, and third days after the menstrual period ended. The technical implementation began with the distribution of three urine pots to respondents who were menstruating. Before the urine collection process was carried out, the researcher first verified the type of sanitary napkin being used by the respondents, whether it was herbal or non-herbal, to prevent bias or confusion in the data. After the midstream urine was collected in a pot on the designated days, the fresh urine samples were immediately measured in vitro using a urine dipstick test. This precise

measurement was performed to assess leukocyte levels and identify bacterial activity through the nitrite parameter in the subjects' urine.

30 subject study selected Which fulfil criteria inclusion The subjects were divided into two groups: group I using herbal pads and group II not using herbal pads. Each individual in each group was asked the first day of their last menstrual period to determine date of collection urine pre menstruation, namely a week before each individual's menstrual cycle. At the scheduled menstrual cycle, group I used herbal sanitary napkins, and group II used non-herbal sanitary napkins during menstruation. After finished time period, the next day the day from every. The group was taken from fresh morning urine in the middle portion for 3 consecutive days after menstruation. The following month, according to the previous cycle, the method is carried out *cross over* that is group I use bandage non herbs Group II used herbal pads. Fresh urine samples were collected in the middle of the morning for three consecutive days after menstruation. Collected data from urine examination results using a dip-stick urine test were processed and tested using a statistical program.

RESULTS AND DISCUSSION

Questionnaires were distributed to 60 respondents to obtain a sample that met the study's inclusion and exclusion criteria, resulting in 30 study subjects. All respondents received all information regarding the interventions to be administered in the study and signed a consent form. Respondent identities were written using their initials to maintain confidentiality and privacy.

Table 1. Characteristics respondents questionnaire and research subjects

Variables	Respondents Questionnaire (%) n=60	Subject Study (%) N=30
History Use Herbal Sanitary Napkins	1 (1.6%)	-
CONSUMPTION CAFFEINE (A DAY)		
1-3 Times	47 (78.3%)	24 (80%)
4-6 Times	-	-
> 6 Times	-	-
No Once	13 (21.6%)	6 (20%)
CONSUMPTION WATER MINERAL		
1-3 Glass (200ml - 600ml)	13 (21.6%)	7 (23.3%)
4-6 Glass (800ml - (1200ml)	36 (60%)	15 (50%)
> 6 Glass (>1200ml)	11 (18.3%)	8 (26.6%)
CYCLE MENSTRUATION REGULAR		
Yes	47 (78.3%)	30 (100%)
No	13 (21.6%)	-
OLD (DAY) MENSTRUATION		
3-4 Days	2 (3.3%)	2 (6.6%)

4-7 Days	45 (75%)	22 (73.3%)
> 7 Days	13 (21.6%)	6 (20%)

Based on the questionnaire results in table 1 regarding the characteristics of questionnaire respondents and research subjects, it was found that 1 person had used herbal sanitary napkins with a history of using herbal sanitary napkins for the past month. In 47 questionnaire respondents (78.3%) and 24 research subjects (80%) it was found that the frequency of consuming caffeine (e.g. coffee and tea) was 1-3 times a day. In 13 questionnaire respondents (21.6%) and 7 research subjects (23.3%) it was found that the frequency of consuming mineral water was 1-3 glasses (200ml-600ml).

The frequency of caffeine consumption per day because it can be a confounding factor, as caffeine consumption is associated with polyuria, one of the clinical symptoms of UTIs. This is because consuming excessive amounts of caffeine can increase the frequency of urination throughout the day. In addition to caffeine consumption, drinking a large amount of mineral water, or more than the minimum daily amount, approximately 8 glasses (1600 ml) can be a factor that can increase urinary frequency. Consuming mineral water in daily life is very important. The minimum daily consumption of mineral water is 8 glasses (1600 ml). Insufficient daily water intake is associated with the risk of urinary tract stones and urinary tract infections. Insufficient water intake causes increased plasma osmolality and decreased effective arterial volume. The end result is decreased urine volume and sodium excretion. A decrease in urine volume will increase osmolality. In other words, it increases the concentration of solutes in the urine. According to its pathogenesis, decreased urine volume and urine flow rate will increase the saturation of stone-forming substances. Urine volume plays a role in preventing calcium stone formation, and a minimum urine volume of 2 liters per 24 hours is recommended.

Based on the results of research conducted by (Febriana IDA, 2019) explaining that research subjects who have a habit of drinking less (<1.5 liters/day) have a risk of calcium oxalate sediment by 4.3 times compared to subjects who drink 1.5 liters/day or more. Drinking 1.5 liters of water/day is one way to prevent supersaturation of insoluble salts in the urine and as part of the function of transporting substances in the body. Increased fluid intake will result in an increase in urine volume, thereby causing the level of saturation (saturation) of calcium oxalate to decrease and reducing the possibility of crystal formation. Low fluid intake reduces the amount of urine, resulting in an increase in calcium and oxalate and a reduction in urine flow.

To determine whether the presence of 1 subject with elevated leukocytes in the non-herbal group represented a statistically significant difference, McNemar's test was applied. The statistical output indicated no significant difference between the herbal and non-herbal pad groups for both urinary leukocytes ($p > 0.05$) and urinary nitrite ($p > 1.00$).

Table 2. The Results Of Urinalysis Using A Dipstick Urine Test

Indicator	Interpretation	Pre Menstruation	Bandage Herbal	Bandage Non Herbal
Leukocytes	Leukocytes < 15	30 -	30 -	29 1

	Leukocytes >15			
Nitrite	Nitrite +	-	-	-
	Nitrite -	30	30	30

Based on the table 2 results of urinalysis using a dipstick urine test carried out during pre- menstruation and post-menstrual urine examination using herbal sanitary napkins, the results showed leukocytes <15 in all research subjects.

This isolated surge in pyuria indicates localized cellular inflammation. Recent urological literature emphasizes that elevated urinary leukocyte counts (>15 cells/ μ L), even in asymptomatic individuals, serve as clear early biological markers for mucosal inflammation or subclinical urothelium irritation. When unbacked by bacterial proliferation, this clinical picture frequently highlights mechanical friction or chemical hypersensitivity stemming from the synthetic polymers embedded within conventional non-herbal pads, which compromises local tissue integrity and elevates downstream susceptibility to opportunistic UTIs. The leukocyte levels > 15 obtained in one research subject after using non-herbal sanitary napkins showed no relationship with personal hygiene history (outside the menstrual cycle) and history of habits during menstruation.

Based on the questionnaire results, the study subjects did not complain of any signs or symptoms suggestive of a urinary tract infection. Furthermore, based on their personal hygiene history (outside of their menstrual cycle) and menstrual habits, they consistently observed good personal hygiene. This does not rule out the possibility that they are at risk for a urinary tract infection. A urine culture, the gold standard for diagnosing a UTI, is necessary. This urine culture test itself takes two to three days to identify the bacteria causing the infection.

Another possibility that can result in a urinalysis test result using a dipstick urine false positive results are due to errors made by the subjects when collecting fresh, mid-morning urine and the type of non-herbal sanitary napkins used during menstruation. Inappropriate non-herbal sanitary napkins can cause irritation and inflammation in the vaginal area. The resulting inflammation can lead to false positive results in urine tests.

Based on the results of a urinalysis using a urine dipstick test, the assessment indicator for measuring the presence of nitrite in urine was obtained, the results of nitrite (-) in all urinalysis examinations, both during pre- menstruation, post-menstruation using herbal and non-herbal pads. Scientifically, a negative nitrite result (-) across all groups cannot be interpreted as an absolute exclusion of bacterial presence. The conversion of nitrate to nitrite requires a sufficient incubation window within the bladder (typically 4 hours) and is exclusively performed by Gram-negative enterobacteria. Gram-positive pathogens or instances of low-density colonization do not trigger a positive nitrite parameter on a dipstick test. Therefore, a confirmatory urine culture must remain the definitive diagnostic benchmark when clinical symptoms persist.

Table 3. Summary of UTI Questionnaire Results

Variables	Research Subjects
Questionnaire Complaint Urinating >1 Symptom	21

No There is Symptom	9
Questionnaire Behavior Hygiene Personal Outside Cycle Menstruation	
Behavior Low- Moderate Risk (Score <30)	16
Behavior Risky Medium- Heavy (Score>30)	14
Questionnaire Behavior Habit During Menstruation	
Behavior Low- Moderate Risk (Score <14)	21
Behavior Risky Medium- Heavy (Score>14)	9

Urinary Complaints

Based on the table 3 results of the questionnaire regarding the distribution of urinary complaints with 13 question variables, it was found that 21 people experienced symptoms that indicated urinary tract infections and 9 people had no symptoms at all.

The most frequently complained about symptoms based on the highest number of research subjects were urgency every time they wanted to urinate (46.6%), feeling incomplete every time they finished urinating (30%), sometimes not being able to hold the urge to urinate before reaching the toilet (13.3%), feeling urine coming out when laughing, sneezing, coughing, jumping, or running (10%), urinating >8 times a day, waking up at night to urinate 3-4 times, needing to push a little when wanting to urinate, feeling that urine takes a long time to come out when wanting to urinate (3.3%).

To establish a definitive diagnosis of urinary tract infection in all study subjects experiencing these symptoms, a urine culture is necessary to identify the bacteria causing the infection. Urine cultures are quite expensive and require 24-48 hours to obtain results. These findings carry substantial implications for preventative women's health programs, particularly within resource-limited or community-centered environments like Beji Village. While urine cultures are constrained by high operational costs and a 24-to-48-hour diagnostic delay, utilizing standardized urine dipstick tests offers a rapid, highly accessible, and low-cost early screening asset. Integrating routine dipstick screenings into community health posts allows midwifery professionals and local health cadres to identify subclinical pyuria early. This facilitates timely behavioral education, prevents severe upper tract complications, and supports targeted, evidence-based menstrual hygiene interventions (Pande & Anjani, 2022). According to clinical practice guidelines for urinary tract infections, the sensitivity of urine culture varies from 50% to 95%, depending on the severity of the infection. Similarly, its specificity ranges from 85% to 99%.

Urine culture is not recommended for patients with uncomplicated urinary tract infections due to its low sensitivity and time-consuming procedure. For patients with uncomplicated urinary tract infections, simple management is sufficient without waiting for urine culture results (Kuswandari et al., 2023).

The stratum corneum of the skin in the vaginal area is physiologically different from other areas of the body. The vaginal area often experiences friction during walking and increases in temperature due to anatomical factors. Therefore, changes in the composition of vaginal flora are not entirely the cause of disease. It all depends on the interaction between microbial virulence, microbial abundance, and the immune system's response (Aisyah, F et al., 2024).

Personal Hygiene Behavior Outside the Menstrual Cycle

Based on the results of the questionnaire regarding personal hygiene outside the menstrual cycle, which includes 16 question variables, the number 2 indicates the highest risk factor, number 1 moderate, and number 0 none at all. The number description is adjusted to the type of question asked in the questionnaire. It was found that 16 people had mild to moderate risk factors (score <30) and 14 people had moderate to severe risk factors (score >30). The personal hygiene risk factors (outside the menstrual cycle) that were carried out most often based on the three highest number of research subjects were the frequency of changing underwear <3 times a day (93.2%), the frequency of cleaning the body (bathing) 1-2 times a day (90%), the type of underwear used was cotton and synthetic (nylon) (40%).

Apart from that, the next most important thing is the frequency of cleaning the inside of the labia. Mayora <3 times a week and not drying the vaginal area every time after urinating (33.3%), drying the vaginal area every time after urinating using a towel (non-disposable) and washing underwear separately from other clothes (23.3%), frequency of cleaning the vaginal area <3 times a week and how to clean the rectum and vagina after defecating (BAB) from back to front (19.9%).

It was also found that people cleaned the vaginal area using bath soap (16.6%), sometimes cleaning the inside of the labia. Mayora (cleaned with water or using soap) and washing underwear using soap (13.3%), cleaning pubic hair in the feminine area using water (10%), sometimes cleaning the feminine area, cleaning the inside of the labia Mayora using soap, and not drying underwear in the sun (6.6%), frequency of cleaning pubic hair > once every 2 months (3.3%).

The frequency of changing underwear per day is related to risk factors for infections, both urinary tract infections and infections of the reproductive tract. When associated with the questionnaire results, there were 6.6% of 60 questionnaire respondents and 6.6% of 30 research subjects were at risk of urinary tract infections due to the frequency of changing underwear <3 times per day. If the underwear used is a material that cannot absorb sweat or water (e.g., synthetic (nylon)), then this can increase the risk of UTI. However, if the type of underwear used is a material that can absorb sweat (e.g., cotton), the predisposing factor for UTI can be reduced but is closely related to the frequency of changing underwear per day. Types of underwear such as synthetic materials (nylon) that do not absorb sweat as much as cotton, can cause the perineum to become moist and increase the risk of urinary tract infections (Rahayu & Kurniawati, 2024).

Drying underwear in the sun is one way to kill germs and bacteria. However, if washed underwear isn't dried in the sun, it can create damp conditions and encourage bacterial growth. The recommended minimum frequency for cleaning pubic hair, especially by trimming, is once every 40 days, or approximately once a month. Failure to do so can increase the risk of UTIs (Susilowati, 2024).

The questionnaire results showed that 2 (3.3%) of the 60 questionnaire respondents and 1 (3.3%) of the 30 research subjects were at risk for urinary tract infections. Drying the vaginal area using non- disposable or non-single-use towels is a predisposing factor for UTIs, if the use of these towels is followed by infrequent towel changes. A previous study conducted by (Nuari, 2019) stated that the frequency of reproductive tract infections is high in women who use (non- disposable) cloths to dry the vaginal area. Drying the vaginal area after urination is a preventive measure to prevent the creation of a wet and humid environment in the vaginal area that can increase bacterial proliferation.

Habitual Behavior During Menstruation

Based on the results of the questionnaire regarding menstrual habits, which included eight variables, 2 indicates the highest risk factor, 1 indicates moderate, and 0 indicates no risk at all. The numerical values were adjusted according to the type of questions asked in the questionnaire.

It was found that 21 people had mild to moderate risk factors (score <14) and 9 people had moderate to severe risk factors (score >14). The risk factors for menstrual habits that were frequently carried out based on the highest number of research subjects were the frequency of changing sanitary napkins used during menstruation (average during menstruation) <3 times (86.6%), frequency of cleaning the body (bathing) 1-2 times a day (80%), cleaning the feminine area using soap during menstruation (26.6%), cleaning the feminine area during menstruation by doing it from back to front (3.3%).

The frequency of changing sanitary napkins during menstruation is closely linked to the occurrence of infections, both reproductive tract infections and urinary tract infections. Previous research has shown (Susilowati, 2024) that changing sanitary napkins every 3 to 4 hours during menstruation can reduce the risk of urinary tract infections. This behavioral pattern directly correlates with pathogen proliferation. Comparative analysis with prior epidemiological studies underscores that women who replace pads fewer than three times a day face a three- to four-fold increase in UTI risks compared to those adhering to the standard medical protocol of exchanging pads every 3 to 4 hours. Prolonged exposure to stale menstrual blood alters the local perineal ecosystem, shifting the physiological vaginal pH and accelerating the upward migration of perineal flora into the lower urinary tract.

Based on the questionnaire results, it was found that the frequency of changing sanitary napkins during menstruation of more than 3 times a day was less than half of all questionnaire respondents and research subjects. This is when compared to the theory, all questionnaire respondents and research subjects are at risk of urinary tract infections. However, there are several other factors that influence the occurrence of urinary tract

infections related to the frequency of changing sanitary napkins in a day during menstruation, namely: the duration of exposure related to how long the habit of changing sanitary napkins <3 times a day during menstruation, the type of sanitary napkin used, and the habit of cleaning the feminine area during menstruation.

Another factor associated with infection, besides changing sanitary pads frequently during menstruation, is daily bathing frequency. Bathing frequency is indirectly related to the frequency of cleaning the reproductive organs. Therefore, the higher the daily bathing frequency, the higher the frequency of daily cleaning of the reproductive organs during menstruation (Susanti, E. M., & Wijaya, P. S, 2020). Using soap to clean the vaginal area frequently and for a long period of time can change the environmental conditions in the vaginal area, one of which is changing the vaginal pH which can increase the risk of UTIs.

Previous research has shown (Devi & Sangeetha, 2023) a high frequency of reproductive tract infections in women who use soap or shampoo to clean their genitals. Based on the questionnaire results, when compared with the theory put forward in the study, it can be concluded that 31.6% of the 60 questionnaire respondents and 16.6% of the 30 research subjects are at risk of developing urinary tract infections.

Incorrect cleaning technique for the perineum and genital area, i.e., from back to front, can increase the risk of urinary tract infections due to the transfer of bacteria from the anus to the vagina. On average, all questionnaire respondents and research subjects used the correct technique for cleaning the perineum and genital area, which is from front to back. However, one study subject (3.3%) did clean the perineum and genital area from back to front.

The novelty of this preliminary study lies in its integrated assessment of sanitary pad type, menstrual hygiene behavior, urinary symptoms, and objective urinalysis findings within a crossover design. Previous studies have mainly discussed the antimicrobial properties of herbal sanitary pads or the relationship between individual hygiene practices and reproductive or urinary tract infections (Devi & Sangeetha, 2023; Rahayu & Kurniawati, 2024; Susilowati et al., 2024). In contrast, the present study directly compared urinary leukocyte and nitrite profiles after the use of herbal and non-herbal sanitary pads while simultaneously evaluating participants' personal hygiene and menstrual practices. The finding that all subjects had normal leukocyte levels and negative nitrite results after using herbal sanitary pads, whereas one subject showed elevated leukocytes after using a non-herbal pad, provides preliminary evidence that the potential effects of sanitary pad use should be interpreted together with behavioral factors, local irritation, and menstrual hygiene practices rather than as an isolated determinant of UTI risk.

These findings have broader relevance for women's health promotion, particularly in communities where limited menstrual health literacy, inadequate sanitary pad replacement, inappropriate genital cleansing, and restricted access to laboratory-based UTI diagnosis remain important challenges. Educational programs should therefore emphasize regular sanitary pad replacement, appropriate perineal cleaning from front to

back, avoidance of excessive soap use in the genital area, adequate hydration, and the selection of sanitary products that minimize moisture and irritation (Susanti & Wijaya, 2020; Devi & Sangeetha, 2023; Susilowati et al., 2024). In addition, the use of an accessible urine dipstick test alongside menstrual hygiene assessment may support early community-based screening and health education, although urine culture remains necessary for definitive diagnosis when symptoms or abnormal urinalysis results persist. This integrated approach may be adapted to menstrual and reproductive health programs in other resource-limited settings to support the prevention and early recognition of urinary tract problems among women of reproductive age.

CONCLUSION

Based on the study, 70% of subjects (21/30) exhibited clinical UTI symptoms, primarily urinary urgency (46.6%) and a feeling of incomplete voiding (30%), with frequent caffeine consumption (80%) and inadequate water intake acting as confounding factors. Risky personal hygiene habits were prevalent both outside menstruation—where 46.7% showed moderate-to-severe risk factors such as changing underwear less than three times daily (93.2%), bathing 1–2 times daily (90%), and wearing non-cotton underwear (40%)—and during menstruation, where 86.6% replaced sanitary napkins less than three times daily (below the recommended 3–4 hour interval) and 26.6% used pH-disrupting soaps. Despite these clinical complaints and high-risk behaviors, dipstick urinalysis pre- and post-menstruation using herbal sanitary napkins revealed normal leukocyte levels (<15) and negative nitrite results in 100% of subjects, indicating an absence of active bacterial infection; only one subject (3.3%) in the non-herbal group showed elevated leukocytes (>15), which was suspected to be a false positive due to non-infectious local irritation or midstream urine sampling error.

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