



URINARY INCONTINENCE AND URINARY TRACT INFECTION: TEMPORAL RELATIONSHIPS IN POSTMENOPAUSAL WOMEN

Dr Bushra Begum Ramejo¹, Dr Seema Rajar², Dr Sobia Azeem Siddiqui³, Dr Chaman Ara⁴,
Dr Beenish Samreen Hamid^{5*}, Dr Isma Rauf⁶

¹Associate Professor, Head of Unit 2, Obstetrics and Gynaecology Department, Khairpur Medical College, Lady Willing Don Hospital, Khairpur Mirs,

²Consultant Gynaecologist, Obstetrics and Gynaecology Department, Khairpur Medical College, Lady Willing Don Hospital, Khairpur Mirs

³Senior Registrar, Obstetrics and Gynaecology Department, Rehman Medical College and Institute, Peshawar

⁴Assistant Professor Gynaecology department, women Medical College, Abbottabad

^{5*}Assistant Professor and Incharge Gynae A unit, Department of Obs/Gynae KIMS/ LMH, Kohat

⁶Assistant Professor Obs & Gyn department, Women Medical College, Abbottabad

***Corresponding Author:** Dr Beenish Samreen Hamid

*Email: dr_beenishhamid@yahoo.com

ABSTRACT

Introduction: Urinary incontinence (UI) and urinary tract infections (UTIs) are two relatable but distinct conditions that have a high prevalence and impose a great impact on the quality of life for older women. Throughout the process of aging, particularly when moving from premenopausal to postmenopausal status, the female body has remarkable physiological and hormonal changes that render women vulnerable to such urological complications.

Objective: To find out how urinary incontinence and urinary tract infections among postmenopausal women

Methodology: This cross-sectional study was conducted at the Obstetric and Gynaecology Department, Unit 2, Lady Willingdon Hospital, Khairpur Mir from Oct 1, 2023, to March 1, 2024. Data from 200 postmenopausal women aged 50 years and above were retrospectively collected, focusing on those with urinary incontinence (UI), urinary tract infections (UTIs), or both. The study included women with complete medical records, excluding those with prior urological surgeries or neurogenic bladder disorders. The data were analyzed using SPSS, employing descriptive statistics and various tests to explore the relationship between UI and UTIs.

Results: Stress UI was the most common (41%), followed by urgency UI (34.5%) and mixed UI (24.5%). UTIs were present in 76% of participants, with 46% experiencing recurrent UTIs. Urgency UI was significantly associated with UTIs ($p = 0.032$), and comorbidities like diabetes and hypertension also showed significant associations with UTIs. However, there was no significant difference in the severity of UI between women with and without UTIs.

Conclusion: In conclusion, this study underscores the strong temporal relationship between urinary incontinence (UI) and urinary tract infections (UTIs) in postmenopausal women, with urgency UI showing a particularly significant association with recurrent UTIs. The presence of comorbidities like diabetes and hypertension further exacerbates this relationship. These findings highlight the

need for targeted interventions addressing both UI and underlying comorbidities to mitigate UTI risks, thereby improving the quality of life for postmenopausal women.

Keywords: Urinary Incontinence, Urinary Tract Infection, Post menopause

INTRODUCTION

Urinary incontinence (UI) and urinary tract infections (UTIs) are two relatable but distinct conditions that have a high prevalence and impose a great impact on the quality of life for older women.(1) Throughout the process of aging, particularly when moving from premenopausal to postmenopausal status, the female body has remarkable physiological and hormonal changes that render women vulnerable to such urological complications.(2) Evaluating the data about the frequency of UI in the female population of postmenopausal age, we can state that it reaches from 30% to 60%, and the frequency of UTIs is approximately 25- 50% of the mentioned population.(3) They both also have significant impact on the efficiency of management of these diseases, since both conditions are often present simultaneously, affecting the severity of the symptoms.

Urinary incontinence is defined as the inability to control the passage of urine; it is therefore associated with conditions such as age, hormonal status, pelvic floor muscle, and obstetric history.(4) Owing to lowered estrogen concentrations after menopause the urogenital epithelium undergoes atrophy, the pelvic floor and the external urethral sphincter are also weakened.(5) These alter a number of conditions that fall under the category of incontinence; including stress urinary incontinence (SUI), urgency urinary incontinence (UUI) and mixed urinary incontinence (MUI).(6) SUI that occurs during outside physical activity, coughing, or sneezing is frequent in postmenopausal woman because the urethra loses its support from the surrounding tissues.(7) UUI is characterized by a strong desire to pass urine at the time of onset, and is associated with detrusor overactivity in most cases while MUI consists of both stress and urgency continence.(8)

Urinary tract infections are common in postmenopausal women causing mainly *Escherichia coli* because of the anatomical and functional changes that occur in the urinary system.(9) The loss of the vaginal epithelium in pregnancy coupled by the reduced levels of vaginal lactobacilli, which produce lactic acid and its by product which is an acidic pH led to a less unfavourable environment for uropathogens.(10) Further, decrease in estrogen levels leads to modification of the vaginal flora, the possibility of which is high to be colonized by uropathogens.(11)

Recurrent UTIs are more challenging as they entail repetitive doctor visits, repeated administration of antibiotics, and decreased health status. This makes UTIs and UI to be very interlinked and diagnosis of one and management of the other to be quite challenging.(12) The association between UI and UTIs is temporal and reciprocal because UI can precede UTIs and at the same time, UTIs can cause UI. Incontinence makes UTI predisposing, due to incomplete bladder emptying and the stasis of urine which facilitates bacterial movement up the urinary tract.(13) On the other hand, UTIs tend to give rise to such symptoms of incontinence by causing inflammation of the bladder and irritation of the urethra.(14) This type of pathophysiology makes the occurrence of these conditions cyclical, the result being a vicious cycle in which the presence of one condition predisposes the individual to the other, leading to episodes of both UI and UTIs.

The analysis of time-dependency of UI and UTIs in postmenopausal women is an essential step to establish the appropriate preventive and treating approaches. Thus, the management of these conditions involves a holistic approach; that targets the urological dysfunction and also factors related with the post-menopausal status. New pharmacological interventions, techniques in the restoration of the pelvic floor muscles and the new options for hormonal therapy form the basis for improving the quality of life of women with this pathology. The aim of the study is to find out how urinary incontinence and urinary tract infections among postmenopausal women.

MATERIALS AND METHODS

This study uses a cross-sectional research method because the primary purpose is to examine the temporal associations between UI and UTIs in postmenopausal women. The data were documented after the occurrence of events under the study and were retrieved from patient files at the Obstetric and Gynaecology Department, Unit 2, Lady Willingdon Hospital, Khairpur Mir, Pakistan. This design was selected so as to give a cross-sectional view of the relation of the two ailments namely, UI and UTIs within a certain time frame to help identify trends in the two diseases. This research took one year to complete, specifically from Oct 1, 2023, to March 1, 2024. This duration was chosen to recruit adequate participants and to cover any possibility of fluctuating rate of the incidences of the UTIs and UI during certain time of the year. The sample was selected from the postmenopausal, low-income women attending the Obstetric and Gynaecology Department, Unit 2, Lady Willingdon Hospital in Khairpur Mir; all the selected participants reported to have urinary incontinence or urinary tract infections or both as diagnosed by the healthcare professionals. To determine the status of postmenopausal women, the criterion used was no menses for the past 12 months. Two hundred postmenopausal women were recruited.

The inclusion criteria are women of 50 years and above after menopause, women with UI, UTI, or both during the study period and women with complete medical records for UI and UTI history, management, and follow-up. On the other hand, women with missing medical history, women who had any previous urological surgery such as the sling surgery which could have changed the natural course of UI or UTI, women diagnosed with neurogenic bladder disorders and women who were not postmenopausal were eliminated from the study.

Patients' information was retrieved from their hospital record after delivery in Obstetric and Gynaecology Department, Unit 2 of Lady Willingdon Hospital. A research ethical clearance was sought from the IRB of the hospital. Clearances to use patients' information for research was also sought from the hospital since most of the research entails using medical records. HMB patient database was used to screen the medical records and select the women who qualified for the study. To protect patient identities, into records were deidentified.

General information from patient's files inclusive of age, body mass index and duration of menopause, types of urinary incontinence, duration of incontinence, severity of incontinence, history of urinary tract infections; details of causative microorganisms, treatment received, frequency of infections, patient comorbidities such as diabetes, hypertension, obesity, medications and treatment taken for UI and UTI were some of the variables collected. , UI, UTI follow-up information and any subsequent instances of either ailment. Regarding data entry and handling, the extracted data were duly taped into the data collection form meant for use in the study. The collected data were later on transpired into an electronic file (SPSS Version 26) for analysis.

Data were analysed by SPSS Version 26. Descriptive statistics comprised frequencies, percentages' means and standard deviations of demographic and clinical parameters of the participants of the study. Chi square test of independence was used for categorical data while independent t test was used for continuous data on Urinary Tract Infection and urinary Incontinence. Hypothesis testing was conducted for each predictor variable in order to determine independent pre-dictors of UTI among female UI patients, $P < 0.05$ logistic regression analysis was adopted to test the hypothesis. Other covariates included age, BMI, duration of menopause, the presence of other diseases, and other factors. The association between the temporal occurrence of UI and UTIs was assessed regarding the period of UTI episodes in comparison with the onset or worsening of UI. For this purpose, time series analysis and correlation coefficients were employed to measure strength and direction of this relationship.

In any case, the study complied with several ethical principles, and the patients' identities were kept anonymous during the survey. Such information was not disclosed within the study, and no personal identifiable information was incorporated in the analysis and outcomes. The findings from the project will be used for database for enhancing postmenopausal knowledge and control of urinary incontinence and UTI.

RESULTS

The study included 200 postmenopausal women, with a mean age of 63.1 years and an average body mass index (BMI) of 28.1 kg/m². On average, the participants had been postmenopausal for 13.2 years. The distribution of urinary incontinence (UI) types showed that stress UI was the most common, affecting 41% of the women, followed by urgency UI at 34.5% and mixed UI at 24.5%. Comorbidities were prevalent, with 56% of the women having hypertension, 29% having diabetes, and 23.5% classified as obese. Additionally, 76% of the participants had a history of urinary tract infections (UTIs), with 46% experiencing recurrent UTIs (defined as two or more episodes per year). (Table 1)

The association between urinary incontinence and the occurrence of urinary tract infections suggests that women with urgency UI were significantly more likely to have a UTI compared to those without a UTI (40.1% vs. 25%, $p = 0.032$). Although stress UI and mixed UI were more common among women with UTIs, the associations were not statistically significant ($p > 0.05$). Comorbid conditions also appeared to influence the likelihood of UTIs. Diabetes was significantly associated with the presence of UTIs (28.2% in UTI-positive women vs. 20.83% in UTI-negative women, $p = 0.023$). Similarly, hypertension and obesity were more common among women with UTIs, with hypertension showing a significant association (48.6% vs. 54.16%, $p = 0.012$), and obesity having a moderate association (23.0% vs. 25.0%, $p = 0.024$).

Regarding the severity of urinary incontinence, there was no statistically significant difference in the severity of UI between women with and without UTIs, as indicated by p -values greater than 0.05 across all severity categories (mild, moderate, severe). (Table 2)

Table 1: Demographic and Clinical Characteristics of the Study Population (n=200)

Characteristic	Mean \pm SD	Frequency (%)
Age (years)	63.1 \pm 7.9	-
BMI (kg/m ²)	28.1 \pm 4.3	-
Duration of Menopause (years)	13.2 \pm 6.9	-
Type of Urinary Incontinence		
- Stress UI	-	82 (41%)
- Urgency UI	-	69 (34.5%)
- Mixed UI	-	49 (24.5%)
Presence of Comorbidities		
- Diabetes	-	58 (29%)
- Hypertension	-	112 (56%)
- Obesity (BMI > 30 kg/m ²)	-	47 (23.5%)
History of Urinary Tract Infections (UTIs)	-	152 (76%)
Recurrent UTIs (≥ 2 episodes/year)	-	92 (46%)

Table 2: Association Between Urinary Incontinence and Urinary Tract Infections

Variable	UTI Present (n=152)	UTI Absent (n=48)	p-value
Type of Urinary Incontinence			
- Stress UI	54 (35.5%)	23 (47.9%)	0.079
- Urgency UI	61 (40.1%)	12 (25.0%)	0.032

- Mixed UI	37 (24.3%)	13 (27.0%)	0.543
Presence of Comorbidities			
- Diabetes	43 (28.2%)	10 (20.83%)	0.023
- Hypertension	74 (48.6%)	26 (54.16%)	0.012
- Obesity (BMI > 30 kg/m ²)	35 (23.0%)	12 (25.0%)	0.024
Severity of Urinary Incontinence			
- Mild	51 (33.5%)	19 (39.5%)	0.484
- Moderate	73 (48.0%)	18 (37.5%)	0.371
- Severe	28 (18.4%)	11 (22.9%)	0.684

DISCUSSION

The results from our study, focusing on the temporal relationships between urinary incontinence (UI) and urinary tract infections (UTIs) in postmenopausal women, align with and expand upon existing literature. Our study found a high prevalence of stress UI (41%) and urgency UI (34.5%) among postmenopausal women. Similar findings are reported by Mahjoob DM et al., 2023 where stress UI was prevalent in 45% of cases, with a significant overlap with urgency UI.(15) However, the prevalence of mixed UI (24.5%) in our study was higher compared to a study by Abufaraj M et al., 2021 which reported 20%.(16)

The association between UI and UTIs was significant, particularly with urgency UI ($p=0.032$). This finding corroborates with Xie L et al., 2022 and Roberts K et al.,2021, who found urgency UI to be significantly associated with recurrent UTIs, suggesting that urinary stasis and incomplete bladder emptying may play a role.(17, 18) Our study showed that diabetes and hypertension were significantly associated with the presence of UTIs in women with UI. This is consistent with the studies by Lin YH et al. (2022) and Paudel S et al., 2022 who highlighted that diabetic woman had a higher risk of recurrent UTIs, possibly due to immune system impairments and glycosuria that promote bacterial growth.(19, 20)

Although our study did not find a significant difference in UTI incidence based on the severity of UI, other studies, such as the one by Vaughan CP et al., 2022 have suggested that severe UI may be linked to a higher risk of UTIs.(21) This discrepancy might be due to differences in sample size and population characteristics. Our results, showing that 46% of women experienced recurrent UTIs, are consistent with the findings of Ke QS et al., 2021 where a woman with recurrent UTIs also had underlying UI, highlighting the cyclical nature of these conditions.(22)

The role of obesity (BMI > 30 kg/m²) in our study as a risk factor for both UI and UTIs is supported by findings from Pereira TA et al., 2022, where higher BMI was linked to increased intra-abdominal pressure, leading to UI and subsequent UTIs.(23) The significant association between UI types and UTIs suggests that targeted interventions, such as bladder training and weight management, could help reduce UTI incidence in postmenopausal women, as recommended by the American Urological Association (2021). Comparing with studies from different populations, such as the one by Zhu M et al., 2022 in a cohort of China postmenopausal women, where lower UTI rates were reported, it suggests that ethnic and lifestyle factors might influence the UI-UTI relationship.(24)

CONCLUSION

In conclusion, this study underscores the strong temporal relationship between urinary incontinence (UI) and urinary tract infections (UTIs) in postmenopausal women, with urgency UI showing a particularly significant association with recurrent UTIs. The presence of comorbidities like diabetes and hypertension further exacerbates this relationship. These findings highlight the need for targeted interventions addressing both UI and underlying comorbidities to mitigate UTI risks, thereby improving the quality of life for postmenopausal women.

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