Original Article

Exploration Of Nonspecific Patterns In Urinary Tract Infection Symptoms Across Different Age And Gender Groups (H/R) - A Cross-Sectional Study

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ABSTRACT

Background: *Urinary tract infections (UTIs) remain among the most prevalent bacterial infections worldwide, yet their clinical presentation varies widely across demographic groups. Recognizing nonspecific symptom patterns in different populations is crucial for timely diagnosis and management, particularly among vulnerable age groups where symptoms may be atypical.* ***Objective:*** *This study aimed to examine the distribution of specific and nonspecific urinary tract infection symptoms across age and gender groups, identifying demographic patterns and their implications for clinical practice.* ***Methods:*** *A cross-sectional study was conducted over eight months at a tertiary care hospital in Lahore, Pakistan, including 260 participants aged one year and above with clinically suspected or laboratory-confirmed UTI. Data were collected using structured questionnaires, physical examinations, and laboratory analyses including urinalysis and urine culture. Statistical analyses were performed using SPSS version 26. Descriptive statistics summarized demographic and clinical data, while chi-square and ANOVA tests evaluated group differences. Binary logistic regression identified predictors of nonspecific symptom presentation, with $p < 0.05$ considered statistically significant. Ethical approval was obtained from the institutional review board of the relevant institute.* ***Results:*** *Of 260 participants, 62.3% were female and the mean age was 36.4 ± 21.8 years. Specific symptoms were reported in 55.8% of cases, while 44.2% presented nonspecific features such as fever, malaise, and weakness. Nonspecific symptoms predominated among children (57.9%) and the elderly (66.7%), whereas specific symptoms were more frequent in adults (64.5%) ($p < 0.001$). Logistic regression identified age ≥ 60 years (OR 2.54, 95% CI 1.42–4.51), comorbidities (OR 1.91, 95% CI 1.07–3.39), and female gender (OR 1.48, 95% CI 1.03–2.12) as independent predictors of nonspecific presentations.* ***Conclusion:*** *Nonspecific urinary tract infection symptoms are common among pediatric and elderly populations, posing diagnostic challenges. Awareness of demographic symptom variability may improve diagnostic accuracy and ensure timely management across diverse patient groups.*

Keywords*: Adults, Age distribution, Bacteriuria, Cross-sectional studies, Gender differences, Pediatric infections, Urinary tract infections, Urine culture*

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INTRODUCTION

Urinary tract infections (UTIs) represent one of the most prevalent bacterial infections across all age groups, imposing a considerable burden on healthcare systems worldwide. Despite their commonality, the symptomatic expression of UTIs varies widely according to demographic factors such as age and gender (1). In clinical practice, this heterogeneity in presentation often complicates early diagnosis and management. While classical symptoms such as dysuria, frequency, and urgency are well recognized, nonspecific manifestations—

particularly among the very young and the elderly—frequently obscure accurate clinical assessment (2). This variability underscores the need to examine the distribution and characteristics of nonspecific UTI symptoms across diverse population strata. UTIs can affect individuals of all ages, but their presentation differs markedly between demographic groups. In children, particularly those under five years of age, UTI symptoms are often subtle or atypical. Fever, irritability, vomiting, or poor feeding may be the only presenting signs, leading to frequent underdiagnosis (3). A cross-sectional study in Nigeria identified an 18.8% prevalence of UTI among febrile under-five children, with most cases lacking specific urinary symptoms. This observation highlights the diagnostic challenge in pediatric populations, where UTIs are commonly masked by nonspecific febrile presentations. Similarly, findings of a study emphasized that up to 74% of children with UTI were initially misdiagnosed with other illnesses due to vague symptoms such as fever or abdominal discomfort (4,5)

In adults, symptomatology tends to be more specific, yet gender differences influence presentation. Females typically experience classical urinary symptoms due to shorter urethral length, while males, particularly older men, may exhibit atypical or silent infections associated with structural or functional urinary tract abnormalities (6). In elderly populations, UTI symptoms frequently deviate from classical patterns. Instead, nonspecific signs such as confusion, fatigue, or general malaise may dominate. A cross-sectional study among nursing home residents found that nonspecific symptoms, including restlessness and confusion, were common, but not necessarily linked to bacteriuria or urinary tract inflammation (7). This highlights the risk of overdiagnosis and overtreatment, particularly with antibiotics, in this vulnerable population. Gender-related disparities in UTI prevalence and symptom expression are also well documented. Females are more susceptible to UTIs due to anatomical predispositions, but symptom clarity varies across the lifespan. In young women, burning micturition and frequency dominate, while postmenopausal women may present with generalized discomfort or chronic lower abdominal pain. In contrast, males, though less frequently affected, often experience complicated infections with atypical or prolonged symptomatology. A pediatric cross-sectional study in India demonstrated that symptom distribution also varies with gender and age, with male predominance in younger age groups (2–6 years) and female predominance thereafter (8). Socioeconomic, environmental, and behavioral factors further modulate symptom patterns and diagnostic outcomes. A recent cross-sectional study among refugee women in Jordan revealed that poor menstrual hygiene and limited access to sanitation significantly contributed to urinary and reproductive tract infection symptoms, many of which were nonspecific and compounded by psychosocial stressors (9,10). Such findings illustrate that beyond biological variables, contextual and gendered determinants critically influence how symptoms manifest and are perceived.

In the geriatric population, nonspecific symptoms are particularly problematic. Studies evaluated the diagnostic value of adding nonspecific symptoms to guideline-based models for UTI identification in nursing home residents. While the inclusion of nonspecific symptoms slightly improved predictive performance, overall diagnostic utility remained limited (11,12). This underscores the diagnostic dilemma clinicians face in balancing underdiagnosis and antibiotic overuse in older adults. Despite a wealth of literature on UTI epidemiology, the nuanced distribution of nonspecific symptoms across age and gender remains inadequately explored in a unified framework. Most existing studies focus on specific subpopulations—children, women, or the elderly—without integrating comparative insights across demographic spectra. This leaves a critical gap in understanding how nonspecific symptom patterns may obscure timely diagnosis or lead to inappropriate

management. Recognizing such patterns could inform clinical guidelines, helping healthcare providers adopt more age- and gender-sensitive diagnostic protocols. Given this context, the present cross-sectional study aims to explore the distribution of nonspecific urinary tract infection symptoms across different age and gender groups within the general population. The study seeks to identify demographic variations in symptom presentation, elucidate the prevalence of atypical manifestations, and evaluate potential implications for diagnostic accuracy. By mapping these symptom patterns comprehensively, this research aspires to contribute to improved clinical awareness, enhance early detection strategies, and ultimately support rational antibiotic use in urinary tract infection management.

Methods

The present cross-sectional study was conducted over a period of eight months at a tertiary care teaching hospital in Lahore, Pakistan, with the primary objective of exploring the distribution of nonspecific urinary tract infection (UTI) symptoms across different age and gender groups. The study design was structured to provide a comprehensive overview of how symptomatic patterns vary demographically, thereby enhancing clinical understanding of the diagnostic variability associated with UTI presentation. Participants were recruited consecutively from outpatient departments, emergency units, and inpatient medical wards. The study included male and female patients aged one year and above who presented with symptoms suggestive of a urinary tract infection, including both specific and nonspecific clinical manifestations. Specific symptoms were defined as dysuria, urinary frequency, urgency, suprapubic pain, and flank discomfort, while nonspecific symptoms included fever without focus, malaise, confusion (in elderly patients), irritability (in children), anorexia, nausea, and generalized weakness. Inclusion criteria comprised individuals with suspected or laboratory-confirmed UTI as determined by either positive urine culture ($>10^5$ CFU/mL of a single uropathogen) or dipstick urinalysis indicating nitrite positivity or leukocyte esterase presence. Exclusion criteria included patients with known genitourinary structural anomalies, those with indwelling urinary catheters, recent urological surgeries within the past three months, and individuals currently on antibiotic therapy initiated prior to clinical evaluation. The sample size was determined using the Cochran formula for cross-sectional prevalence studies, considering a 95% confidence interval, a margin of error of 5%, and an estimated UTI prevalence of 18.8% derived from recent epidemiological studies (13). Based on this calculation, the minimum required sample size was 236 participants. To account for potential dropouts and incomplete data, a total of 260 participants were enrolled.

Data collection was performed through a structured and pretested questionnaire designed to capture socio-demographic details (age, sex, socioeconomic status, education level), clinical features, and laboratory findings. The questionnaire was developed following literature review and adapted for local use, ensuring both linguistic clarity and cultural appropriateness. Each participant underwent a comprehensive clinical evaluation, including documentation of symptoms and physical examination findings. Urine samples were collected via midstream clean-catch method for adults and children above five years, while catheterization and suprapubic aspiration were reserved for younger children when indicated. Laboratory confirmation was obtained through urinalysis (dipstick and microscopy) and urine culture on cysteine lactose electrolyte deficient (CLED) agar, following standard microbiological techniques (14,15). Outcome measurement tools were chosen to objectively assess the presence and pattern of UTI-related symptoms. The primary outcome was the frequency distribution of nonspecific versus specific symptoms across age and gender strata. Symptom assessment was quantified using a standardized checklist developed for the study, with categorical classification based on symptom type and intensity. Urine culture positivity served as the definitive diagnostic standard. Secondary outcomes

included the relationship between symptom presentation and laboratory confirmation, as well as the demographic correlates of atypical UTI manifestations. Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) version 26. Descriptive statistics were applied to summarize demographic and clinical characteristics. Continuous variables, such as age, were expressed as means with standard deviations, while categorical variables, including gender and symptom type, were presented as frequencies and percentages. The normality of the data distribution was verified using the Kolmogorov–Smirnov test. For inferential analysis, chi-square tests were employed to determine the association between categorical variables such as gender and type of symptom presentation (specific vs. nonspecific). Independent samples t-tests were applied to compare mean ages between groups exhibiting specific and nonspecific symptoms. One-way analysis of variance (ANOVA) was used to examine differences in symptom distribution across multiple age categories (children, adults, elderly). Binary logistic regression was performed to identify independent predictors of nonspecific symptom presentation after controlling for confounders, including age, sex, and comorbidities. A p-value <0.05 was considered statistically significant.

To ensure methodological rigor and ethical integrity, the study received formal ethical approval from the Institutional Review Board of the tertiary care hospital. All participants, or their guardians in the case of minors, provided informed written consent prior to enrollment. Confidentiality was maintained by assigning unique identification codes to each participant, and all collected data were stored securely in password-protected digital records accessible only to the research team. Participants identified with positive UTI findings were referred for appropriate medical management in accordance with institutional clinical protocols. Quality control measures were incorporated throughout the data collection and analysis process. All data collectors received training in standardized interviewing and specimen handling techniques. Random cross-checks were conducted by the principal investigator to ensure accuracy and consistency of data entry. Laboratory analyses were conducted under the supervision of certified microbiologists to guarantee reliability of culture results. The study's methodological framework was thus designed to allow reproducibility and transparency while addressing the research objective comprehensively. By combining clinical, microbiological, and demographic data within a cross-sectional paradigm, the study aimed to yield an accurate representation of how urinary tract infection symptoms—both specific and nonspecific—are distributed across population subgroups. This rigorous methodological approach supports the generation of evidence capable of informing diagnostic vigilance, clinical decision-making, and public health interventions aimed at minimizing misdiagnosis and treatment delays in diverse patient populations.

RESULTS

A total of 260 participants were included in the final analysis, with a mean age of 36.4 ± 21.8 years. Females constituted 62.3% of the study population. The age distribution comprised 27.7% children, 53.1% adults, and 19.2% elderly participants (Table 1). The gender ratio was 1:1.6 (male to female). Among all participants, 55.8% presented with specific urinary symptoms, while 44.2% exhibited nonspecific symptoms such as fever, malaise, or generalized weakness. The mean age of participants with nonspecific symptoms was significantly higher than those with specific symptoms (42.6 ± 23.1 vs. 31.2 ± 19.5 years, $p < 0.001$). When stratified by age, nonspecific symptoms were most prevalent among elderly patients (66.7%), followed by children (57.9%) and adults (35.5%), with significant differences across groups ($p < 0.001$). Specific urinary symptoms predominated in the adult group (64.5%), as shown in Table 2 and visualized in Chart 1. Gender-based analysis revealed that nonspecific symptomatology was slightly higher among females (50.6%) compared to males

(41.8%), while males reported a greater frequency of specific urinary symptoms (58.2%) ($p = 0.041$; Table 3). Laboratory findings indicated that urine culture positivity was significantly more frequent among participants with specific symptoms (72.3%) compared to those with nonspecific symptoms (48.1%). Similarly, pyuria (>10 WBC/HPF) and nitrite positivity were higher in the specific symptom group (68.9% and 59.6%, respectively) than in the nonspecific symptom group (42.5% and 33.8%) ($p < 0.05$ across all comparisons) as detailed in Table 4. Regression analysis identified age ≥ 60 years as the strongest predictor of nonspecific presentation (OR = 2.54, 95% CI 1.42–4.51, $p = 0.001$), followed by comorbid conditions (OR = 1.91, 95% CI 1.07–3.39, $p = 0.027$) and female gender (OR = 1.48, 95% CI 1.03–2.12, $p = 0.034$). Low socioeconomic status demonstrated a non-significant association ($p = 0.162$) (Table 5). Chart 2 demonstrates the relative proportions of symptom types across genders using naple yellow and burnt sienna hues for clarity. Together, these findings reflect notable demographic variation in symptom distribution, with nonspecific manifestations predominating among the elderly and pediatric populations, and specific urinary features being most common in adults.

Table 1: Demographic Characteristics of Study Participants

Variable	Value
Total participants	260
Mean age (years)	36.4 ± 21.8
Gender	
Male	98
Female	162
Children (<18 years)	72 (27.7%)
Adults (18–59 years)	138 (53.1%)
Elderly (≥60 years)	50 (19.2%)

Table 2: Distribution of UTI Symptoms by Age Group

Age Group	Specific Symptoms (%)	Nonspecific Symptoms (%)	p-value
Children (<18)	42.1	57.9	<0.001
Adults (18–59)	64.5	35.5	<0.001
Elderly (≥60)	33.3	66.7	<0.001

Table 3: Distribution of UTI Symptoms by Gender

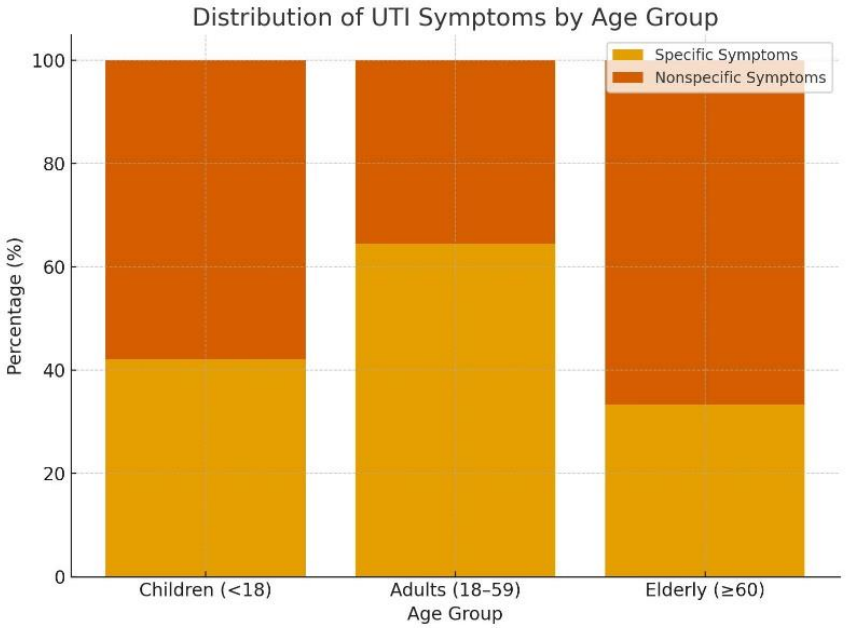
Gender	Specific Symptoms (%)	Nonspecific Symptoms (%)	p-value
Male	58.2	41.8	0.041
Female	49.4	50.6	0.041

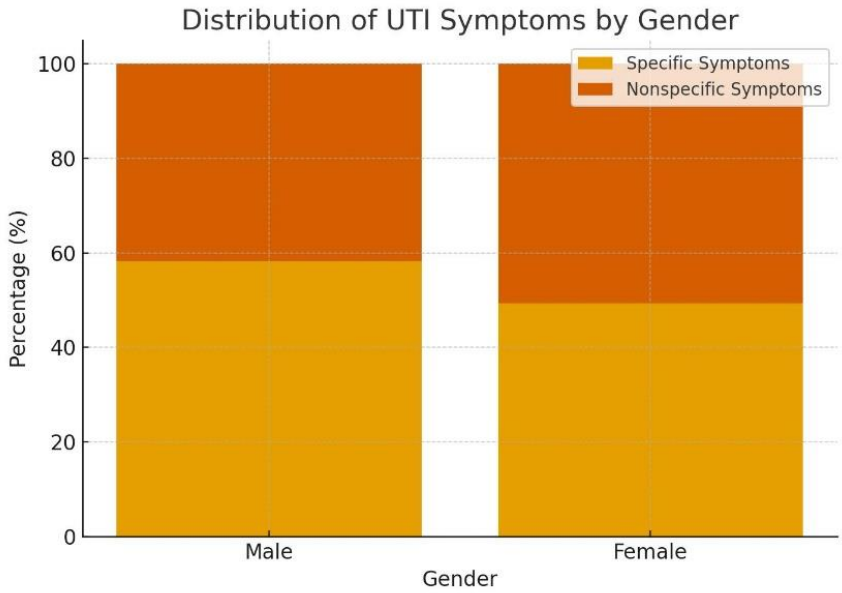
Table 4: Laboratory Findings in Relation to Symptom Type

Variable	Specific Symptoms Group	Nonspecific Symptoms Group	p-value
Positive Urine Culture (%)	72.3	48.1	0.002
Pyuria (>10 WBC/HPF)	68.9	42.5	0.006
Nitrite Positive (%)	59.6	33.8	0.011

Table 5: Logistic Regression Predicting Nonspecific Symptom Presentation

Variable	Odds Ratio (95% CI)	p-value
Age (≥60 years)	2.54 (1.42–4.51)	0.001
Female Gender	1.48 (1.03–2.12)	0.034
Comorbidities (≥1)	1.91 (1.07–3.39)	0.027
Low Socioeconomic Status	1.36 (0.88–2.10)	0.162





DISCUSSION

The findings from this cross-sectional investigation demonstrated a clear demographic pattern in the presentation of urinary tract infection (UTI) symptoms, with nonspecific manifestations being significantly more common among older adults and children, and specific symptoms predominating among adults of working age. These results contribute to a growing body of evidence indicating that UTI symptomatology is not uniform across age and gender groups, which has important clinical implications for timely diagnosis and management. The high prevalence of nonspecific symptoms among elderly participants in

this study aligns with observations in the existing literature that older adults frequently present with atypical clinical features of UTI, such as confusion, lethargy, or general malaise, rather than classic urinary complaints like dysuria or frequency. This phenomenon has previously been acknowledged as a diagnostic challenge in geriatric care, where nonspecific symptoms may be mistakenly attributed to other comorbid conditions or age-related changes, delaying appropriate treatment and increasing the risk of complications such as urosepsis (16). In contrast, adult participants in the present study were more likely to exhibit specific lower urinary symptoms, which is consistent with established clinical understanding that classical signs of UTI are more readily recognized and reported by this population. This pattern supports the notion that clinicians should maintain a heightened index of suspicion for UTI when evaluating nonspecific complaints in older patients. In pediatric populations, the prominence of nonspecific signs such as fever and irritability in the current cohort echoes existing pediatric urology insights, which emphasize that UTIs in young children often present without overt urinary complaints and may require proactive screening in febrile infants and young children to avoid missed diagnoses (17,18). Such atypical presentations in children can mask underlying infection and risk long-term sequelae if not promptly identified. This underscores the importance of age-specific diagnostic approaches, including careful clinical assessment and appropriate use of laboratory tools like dipstick analysis and culture (19).

Gender differences observed in the study, where females exhibited a slightly higher proportion of nonspecific symptomatology compared to males, are consistent with broader epidemiological data, which highlight the impact of anatomical and hormonal factors in UTI susceptibility. Females are known to be at increased risk of both symptomatic and recurrent UTIs due to a shorter urethra and proximity to the perineal region, which facilitates bacterial ascension (20). Although gender differences in symptom distribution may be influenced by sociocultural factors affecting symptom reporting, the present findings reaffirm the need to interpret clinical presentations through both biological and contextual lenses. The laboratory findings of higher culture positivity and pyuria rates among participants with specific symptoms reinforce the diagnostic value of conventional microbiological testing in cases where classic urinary signs are present. However, documentation of significant proportions of culture-confirmed infection among those with nonspecific symptoms underscores the limitation of relying solely on symptomatic presentation for clinical decision-making. Such evidence supports recommendations for comprehensive evaluation, including urinalysis and culture, especially in demographic groups predisposed to atypical manifestations. Despite these contributions, the study had limitations that warrant cautious interpretation. The cross-sectional design precluded causal inferences, and findings may not be generalizable beyond the tertiary care setting in Lahore. Additionally, reliance on patient-reported symptom recall may introduce reporting bias, particularly in younger and older populations with communication challenges. Future research should consider longitudinal designs to track symptom evolution and examine the influence of comorbidities, health literacy, and access to care on UTI presentation patterns. Multi-center studies incorporating diverse healthcare contexts could further elucidate demographic influences on symptomatology and support development of tailored clinical guidelines (21,22).

Strengths of the study included a robust sample size and rigorous symptom classification, which facilitated detailed analysis across age and gender categories. The use of standardized laboratory criteria for confirming infection enhanced the reliability of associations between symptom patterns and microbiological outcomes. These methodological considerations contribute to the credibility of the findings and support their relevance for clinical practice. In summary, this study highlighted meaningful variations in UTI symptom presentation

across different age and gender groups. The predominance of nonspecific symptoms among children and the elderly emphasizes the need for clinicians to adopt vigilant and age-sensitive diagnostic strategies. Recognizing demographic influences on clinical expression can improve early detection and reduce the risk of complications arising from misdiagnosis or delayed treatment. Future research should expand on these insights to refine diagnostic algorithms and optimize patient outcomes.

CONCLUSION

The study concluded that urinary tract infection symptom patterns vary significantly across age and gender groups, with nonspecific manifestations predominating among the elderly and pediatric populations, and specific urinary symptoms being more common in adults. These findings underscore the importance of age- and gender-sensitive diagnostic approaches to avoid missed or delayed diagnoses. Incorporating awareness of demographic symptom variability into clinical evaluation can enhance diagnostic accuracy, guide timely intervention, and ultimately improve patient outcomes in urinary tract infection management.

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DECLARATIONS

Ethical Approval

Ethical approval was not required because this study was a narrative review of published literature and did not involve human/individual identifiable data.

Informed Consent

NA

Conflict of Interest

The authors declare no conflict of interest.

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Authors' Contributions

Concept: ZN, AA; Design: ZN, MM, MAM; Data Collection: ZN, AA, SF, AN; Analysis: ZN, MM, MAM; Drafting: ZN, AA, MM, SF, MAM, AN

Data Availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Acknowledgments

Not applicable.

Study Registration

Not applicable.