

Prevalence of urinary symptoms among adolescents and young females in Eastern Uttar Pradesh

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ABSTRACT

Background: Lower urinary tract symptoms (LUTSs) are increasingly reported more frequently in females, negatively impacting their lives. This study identified the prevalence of urinary symptoms among females in eastern Uttar Pradesh using the International Consultation on Incontinence Modular Questionnaire on Female Lower Urinary Tract Symptoms (ICIQ-FLUTS) questionnaire. **Aims:** This research aimed to determine the prevalence of LUTS in females in eastern Uttar Pradesh. **Methods:** The study involved a one-step sampling approach for surveying adolescents and young girls (11–24 years) in eastern Uttar Pradesh from different primary and secondary schools and colleges. The ICIQ-FLUTS questionnaire was used to evaluate LUTS over the last 4 weeks. Scores ranged from 0 to 48, and SPSS version 25.0 was used for descriptive statistics and Chi-square tests to analyze symptom prevalence and categorical relationships. **Results:** According to our study, nocturia and urgency were more prevalent in all age groups, affecting 66.1% to 72.3% and 69.7% to 68.9%, respectively. Urge urinary incontinence varies from 25.0% in early adolescence to 24.6% in late adolescence. Urban areas residents reported more urgency (65.3%) and bladder pain (42.8%), while rural areas residents had higher incidences of frequent incontinence (49.6%) and nocturia (77.4%). In addition, Hindus had the most frequent levels of LUTS, especially for urgency (60.7%) and nocturia (70.3%). **Conclusions:** The study highlights the high prevalence of LUTS among adolescents and young females and differences in LUTS among different demographics in Eastern Uttar Pradesh. Symptoms increase as age progresses. The urban population showed higher LUTS rates than rural areas, and religious affiliation also impacts symptom prevalence.

Keywords: Adolescents, female, ICIQ-FLUTS, LUTS, prevalence, young

Introduction

Lower urinary tract symptoms (LUTSs) are increasing public health concerns, particularly among women, as their prevalence rates continue to rise. LUTSs have a profound impact on women's quality of life, causing physical discomfort, emotional stress, and isolation. Factors such as obesity, race, pregnancy,

childbirth, occupation, hysterectomy, family history, chronic cough, urethral stricture, bladder outlet obstruction, urinary tract infection, urethral calculus, neurogenic bladder, and depression contribute to this rise.^[1-4] Urinary incontinence, a significant issue in LUTS, is classified by the International Continence Society (ICS) into stress, urge, and mixed.^[5] Studies showed 50% of adult females reported urinary storage symptoms.^[6] It is estimated that approximately 14% of women will undergo surgical treatment for incontinence throughout their lives.^[7] As the population ages, the rising prevalence of LUTS demands more healthcare resources, yet childbirth

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adequately addresses healthcare or public awareness.^[8] LUTSs are frequently associated with urinary incontinence or an overactive bladder (OAB). It is marked by urgent or frequent urges to urinate and includes night time awakenings.^[9-11] These medical conditions often remain misdiagnosed in adolescents and young women because of shame and a lack of awareness. Primary care physicians play critical roles in the early identification and treatment of LUTS, offering possibilities for improved health outcomes through immediate treatment and training. The ICIQ-FLUTS, introduced in 2003, was a standardized questionnaire by the international consultation on incontinence to assess LUTS and their impact on quality of life.^[12-15] In our study, we used the ICIQ-FLUTS questionnaire to estimate the population-based prevalence of LUTS among adolescent females in eastern Uttar Pradesh (UP). This study represents a significant contribution to the existing literature, as it is among the few population-based studies specifically addressing LUTS in adolescent females in India. This research particularly highlights differences in demographics in symptoms prevalence, offer primary care providers with vital information to guide culturally appropriate, population-specific strategies for early identification, patient education, and LUTS management.

Materials and Methods

The study was approved by the Institutional Ethics Committee (ECR/526/Inst/UP/2014/RR-20), with all ethical standards adhered to, including confidentiality and obtaining informed consent. The study was a population-based survey among adolescent girls residing in Eastern UP. The ICIQ-FLUTS, a well-validated questionnaire from the ICI, was employed to ensure the uniformity of the data collected and reliable data gathering. This methodological approach allowed researchers to accurately capture the prevalence and the severity of the LUTS in the surveyed population.

Method of survey sampling

A one-step sampling approach was used to achieve a representative sample of the general adolescent and young female demographic. Females aged 11–24 years were randomly selected from various regions in Eastern UP, with a greater emphasis on adolescents and young, from different primary schools, secondary schools, and colleges. Consent was asked to fill out a questionnaire. No alternative participants were selected when individuals chose not to participate.

Inclusion and exclusion criteria

Female participants between the ages of 11 and 24 years living in Eastern UP who actively enrolled in educational institutions such as primary and secondary schools or colleges were included in the study. Participants who provided written informed consent and agreed to complete the questionnaire were included in the study. Participants were excluded if they were under 10 years old, over 24 years old, and also residing outside.

Selection of questionnaire: ICIQ-FLUTS

The ICIQ-FLUTS was used to ensure a comprehensive and consistent assessment of the LUTS. It is validated and enclosed internationally tool. It delivers a detailed and psychometrically reliable evaluation of pelvis disorders and lower urinary tract dysfunction (Urgency, frequency, and incontinence). It was chosen because of its thorough validation and compliance with international standards, ensuring consistent data across diverse populations. This approach facilitated a representative and detailed analysis of symptom patterns and severity, deepening our understanding of the issue. The ICIQ-FLUTS is divided into three distinct subscales, scoring 0 to 48 points. The initial four questions represent the filling symptoms, scoring 0 to 16 points (F-score). Next, three questions are related to the voiding score (V-score), scored from 0 to 12 points. The final five questions represent the incontinence (I-score), which scored from 0 to 20 points, and the subscale ratio of 1:10 to assess the incontinence severity among the participants.

Sample size calculation

The sample size was calculated by using the formula:

$$n = \frac{Z1 - \alpha / 2 \cdot p \cdot q}{e^2}$$

where $Z1 - \alpha / 2 = 1.96$ (the standard normal deviation for a 95% CI), $P = 0.50$ (the assumed proportion of the population with the characteristics of interest), $q = 0.50$ (a component of p), and $e = 0.05$ (margin of error). Based on this, the initial sample size was 384 participants. Considering the design effect of 2, the sample size was increased to 768. In addition, accounting for a 1% nonresponse rate, the sample size was multiplied by 0.99, resulting in 775.6, rounded to 776 participants. Thus, the final sample size for the study was 776.

Data collection

Researchers gathered data using a pen-and-pencil survey method. The ICIQ-FLUTS questionnaire was used to measure LUTS, covering different ranges of symptoms such as nocturia, urgency, bladder pain, frequency, hesitancy, straining, intermittency, and various forms of urinary incontinence, including unexplained and nocturnal enuresis. Symptoms severity was classified according to the total score of each question item in the ICIQ-FLUTS. The categories are as follows: 0 (Normal), 1 (Mild), 2-3 (Moderate) and 4 (Severe). The overall total scores ranged from 0 to 48 points, with higher scores reflecting more severe LUTS. The scale has been validated internationally, with adequate psychometric properties. Participants were instructed to rate the occurrence of individual LUTS during the previous 4 weeks and evaluate the discomfort's severity. Those reporting LUTSs were further asked to detail the frequency of their symptoms. The number of nightly urinations was quantified as nocturia, while the frequency was defined as eight or more daily urination. Nocturia was considered when the participant had to wake up for urination in the night.

Detailed information regarding sociodemographic backgrounds like age, gender, education level, and religion was also collected.

Statistical analysis

Data was analyzed using Statistical Package for the Social Sciences (SPSS), version 25.0.^[6] Various statistical methods were applied to examine the prevalence of FLUTS and investigate relationships between categorical variables. Descriptive statistics were used to create frequency distributions and percentages (%). This approach summarized how often these symptoms occurred among females. The Chi-square test was also used to evaluate a significant association between the categorical variables related to the urinary symptoms. It determined that the observed distribution of symptoms deviated from what would be expected if no associations existed between the variables.

Results

The study included 766 participants, distributed by age 168 in early adolescence (11–13 years), 356 in middle adolescence (14–17 years), 191 in late adolescence (18–21 years), and 61 in young adulthood (22–24 years). Most of the participants were Hindu (760), followed by Muslims (12) and Jains (4). Participants were also categorized by resident area, with 643 from the urban areas and 133 from the rural areas.

Prevalence of LUTS across age groups

The prevalence of the LUTS across age groups is shown in Table 1. In early adolescence (11–13 years), out of 168 participants, nocturia was reported by 66.1%, urgency was reported by 45.2%, and bladder pain was reported by 26.8%. Frequency was reported by 19.0%, 28.6% had difficulty starting urination, and straining by 13.1%. Intermittency affected 25.6% of participants, while urge urinary incontinence affected 25.0%. Stress urinary incontinence was noted by 22.6%, and unexplained urinary incontinence by 28.0%. Nocturnal enuresis was observed in 8.3% of the participants.

In middle adolescence (ages 14–17), among 356 participants, 69.7% reported nocturia, 62.9% observed urgency, and 41.9% experienced bladder pain. Frequency was noted by 21.6%, hesitancy by 30.3%, and 20.2% experienced straining. Intermittency affected 39.6% of participants, while urge urinary incontinence affected 24.2%, and stress urinary incontinence was reported by 35.1%. Unexplained urinary incontinence was seen in 16.0%, and nocturnal enuresis in 9.8%.

In late adolescence (ages 18–21), among 191 participants, out of which 72.3% reported experiencing nocturia, 67.0% had urgency, and 45.0% experienced bladder pain. In addition, 25.1% experienced frequent urination, 28.8% reported straining, and 45.0% had difficulty starting urination. Intermittency affected 53.9%, urge urinary incontinence was observed in 24.6%, and stress urinary incontinence in 60.7%. Unexplained urinary incontinence was noted in 7.3%, while 8.4% reported nocturnal enuresis.

Table 1: Prevalence of LUTS in adolescents and young adults by the age group

| Age Grouping | Nocturia | Urgency | Bladder Pain | Frequency | Hesitancy | Straining | Intermittency | Urge Urinary Incontinence | Frequency of Urinary Incontinence | Stress Urinary Incontinence | Unexplained Urinary Incontinence | Nocturnal Enuresis |
|------------------------------------|-------------|-------------|--------------|-------------|-------------|-------------|---------------|---------------------------|-----------------------------------|-----------------------------|----------------------------------|--------------------|
| (11-13) Early Adolescence (n=168) | 111 (66.1%) | 76 (45.2%) | 45 (26.8%) | 32 (19.0%) | 48 (28.6%) | 22 (13.1%) | 43 (25.6%) | 42 (25.0%) | 80 (47.6%) | 38 (22.6%) | 35 (20.8%) | 14 (8.3%) |
| (14-17) Middle Adolescence (n=356) | 248 (69.7%) | 224 (62.9%) | 149 (41.9%) | 77 (21.6%) | 108 (30.3%) | 72 (20.2%) | 141 (39.6%) | 86 (24.2%) | 175 (49.2%) | 125 (35.1%) | 57 (16.0%) | 35 (9.8%) |
| (18-21) Late Adolescence (n=191) | 138 (72.3%) | 128 (67.0%) | 86 (45.0%) | 48 (25.1%) | 86 (45.0%) | 55 (28.8%) | 103 (53.9%) | 47 (24.6%) | 116 (60.7%) | 92 (48.2%) | 14 (7.3%) | 16 (8.4%) |
| (22-24) Young (n=61) | 42 (68.9%) | 42 (68.9%) | 16 (26.2%) | 23 (37.7%) | 23 (37.7%) | 8 (13.1%) | 34 (55.7%) | 11 (18.0%) | 31 (50.8%) | 27 (44.3%) | 5 (8.2%) | 3 (4.9%) |
| Overall Prevalence (n=776 (%)) | 539 (69.5%) | 470 (60.6%) | 296 (38.1%) | 180 (23.2%) | 265 (34.2%) | 157 (20.2%) | 321 (41.4%) | 186 (24.0%) | 402 (51.8%) | 282 (36.4%) | 111 (14.3%) | 68 (8.8%) |

For young adults (22–24 years), among 61 participants, 68.9% reported experiencing nocturia and urgency, while 26.2% reported bladder pain. Frequent urination and difficulty starting urination were reported by 37.71%. 13.1% had issues with straining. Intermittency was noted in 55.7% of the participants, urge urinary incontinence in 18.0%, and stress urinary incontinence in 50.8%. Unexplained urinary incontinence was seen in 8.2% and 4.9% experienced nocturnal enuresis. The analysis highlights the significant prevalence of LUTS across all age categories, with varying differences in symptom frequency and type. Nocturia and urgency are more prevalent and reported in every age group. The highest prevalence is seen during the late adolescence. This shows that LUTS becomes increasingly more burdensome as females progress through adolescence. This indicates that more interventions, LUTS prevention protocols, and further studies should be conducted across development phases.

Prevalence of LUTS symptoms across religious groups

The prevalence of LUTS across religions is shown in Table 2. Among 760 Hindu participants, 70.3% reported experiencing nocturia, 60.7% experienced urgency and 38.2% reported bladder pain. Frequent urination was noted in 23.6%, hesitancy in 34.5%, and straining in 20.5%. Intermittency affected 41.6%, urge urinary incontinence was observed in 23.8%, and stress urinary incontinence in 36.4%. Unexplained urinary incontinence was reported by 14.5% and 8.9% experienced nocturnal enuresis.

Among 12 Muslim participants, 25% reported experiencing nocturia, 58.3% had urgency, and 33.3% experienced bladder pain. Frequent urination, hesitancy, and straining were observed in 8.3% of the cases. Intermittency was noted in 33.3%, and urge urinary incontinence in 25.0%. and stress urinary incontinence in 33.3%. Unexplained urinary incontinence was reported by 8.3%, and no cases of nocturnal enuresis were reported.

Among 4 Jain participants, 50.0% reported nocturia, urgency, bladder pain, hesitancy, urge urinary incontinence, and frequency of urinary incontinence. Intermittency and stress urinary incontinence were reported in 25%: no frequent urination, restraining, unexplained urinary incontinence, and nocturnal enuresis. Religious groups showed that LUTS is more prevalent in the Hindu population, with the highest prevalence of the nocturia, urgency, and stress urinary incontinence. Muslims primarily experience prominent occurrences of urgency and bladder pain, fewer cases of straining, and nocturnal enuresis. Jainism females have a high prevalence of urgency, nocturia, and bladder pain. Jainism females have no unexplained urinary incontinence, straining, and nocturnal enuresis.

LUTS prevalence across urban and rural residences

The prevalence of LUTS across urban and rural is shown Table 3. In rural areas, 77.4% reported nocturia, 37.6% had urgency and 15.8% had bladder pain. Frequent urination was noted in

Table 2: Prevalence of LUTS across religion

| Religion | Nocturia | Urgency | Bladder Pain | Frequency | Hesitancy | Straining | Intermittency | Urge Urinary Incontinence | Stress Urinary Incontinence | Unexplained Urinary Incontinence | Nocturnal Enuresis |
|------------------------------|-------------|-------------|--------------|-------------|-------------|-------------|---------------|---------------------------|-----------------------------|----------------------------------|--------------------|
| Hindu (n=760) | 534 (70.3%) | 461 (60.7%) | 290 (38.2%) | 179 (23.6%) | 262 (34.5%) | 156 (20.5%) | 316 (41.6%) | 181 (23.8%) | 277 (36.4%) | 110 (14.5%) | 68 (8.9%) |
| Muslim (n=12) | 3 (25%) | 7 (58.3%) | 4 (33.3%) | 1 (8.3%) | 1 (8.3%) | 1 (8.3%) | 4 (33.3%) | 3 (25.0%) | 4 (33.3%) | 1 (8.3%) | 0 (0%) |
| Jainism (n=4) | 2 (50%) | 2 (50%) | 2 (50%) | 0 (0%) | 2 (50%) | 0 (0.0%) | 1 (25.0%) | 2 (50%) | 1 (25.0%) | 0 (0%) | 0 (0%) |
| Overall Prevalence n=776 (%) | 539 (69.5%) | 470 (60.6%) | 296 (38.1%) | 180 (23.2%) | 265 (34.2%) | 157 (20.2%) | 321 (41.4%) | 186 (24.0%) | 282 (36.4%) | 111 (14.3%) | 68 (8.8%) |

with the findings of Irwin *et al.*^[7] In our study, nocturia prevalence was 66.1% in early adolescence, 69.7% in middle adolescence, and 72.3% in late adolescence, which is consistent with Zhang *et al.* findings. For urinary incontinence, we observed 25% prevalence rates in early adolescence, 24.2% in middle adolescence, and 24.6% in late adolescence, closely resembling Zhang *et al.* Nocturia is mainly reported by rural adolescents, contrasting with urban adolescents who reported a greater incidence of urgency, bladder pain, frequency, straining, urgency, intermittency, and incidence of urinary incontinence. This suggests that LUTSs are more widespread in urban areas than rural areas, corroborating results from Zhang *et al.*, who reported a prevalence of 57.1% for LUTS in urban residents and 53.9% in rural populations. These results highlight the importance of considering residential and environmental factors of urinary symptoms.^[19] According to Serdinšek *et al.*,^[20] 17.8% of adolescent girls experienced at least one symptom of LUTS. Urinary incontinence is the most prevalent (5.9%).

An Indian survey of 118 women found that 27.1% experienced urinary incontinence; participants were mainly from the urban areas (97.5%) and married (91.2%). In addition, 84.1% of the women had completed post-graduation education, 63.3% worked in professional fields, and 50.9% participated in routine exercise. 27.1% overall prevalence of urinary incontinence, with the most common being stress urinary incontinence (43.7%), followed by mixed urinary incontinence (31.2%) and urge urinary incontinence (25%) reported by Soni R. *et al.*^[21] Our research also finds that overall prevalence rates were observed in the study showed that 69.5% had nocturia, 60.6% had urgency, 38.1% had bladder pain, while the lowest prevalence was 8.8% for nocturnal enuresis. Urinary incontinence is the most common symptom, and stress urinary incontinence is more prevalent as compared with urge urinary incontinence except in an early adolescent group. Both studies found that the LUTS prevalence, especially nocturia and urgency, increases with age. It reaches its highest point during adolescence.

This study highlights the importance of early, focused medical care and awareness initiatives that target specific demographics. Primary care physicians have the ideal opportunity to adopt such interventions because of their active participation in preventative medicine and education of patients. Using validated tools such as the ICIQ-FLUTS questionnaire, primary care practitioners may identify LUTS early, generate appropriate referrals to specialists when required, and deliver patient-centered treatment methods.

The strength of our study is that it is comprehensively divided into demographics, including diverse age groups. In addition, participants from both rural and urban residences will be involved. Data allow for detailed analysis of how urinary symptoms vary across adolescence and young age and environmental influences on urinary health. The sample size of 776 females is unable to wide-ranging the perspective of urinary symptoms. This comprehensive nature of data supports the development of early targeted health interventions, bladder health awareness,

and clinical practices for specific groups. Employing a validated urinary symptoms questionnaire that follows the ICS guidelines facilitated a direct comparison of our results with those reported in existing research.

Our study has limitations that the majority of our participants were from Eastern UP, with a shortage of participation from smaller religious and cultural groups. This restricts the practical significance of our findings to broader communities. Future research should use a more diverse and representative sample to promote inclusivity and ensure the findings applicable to a wide range of populations. The cross-sectional approach used in the research limits observations to a single time in duration, reducing insight into the development and shifts in time in LUTS.

The cross-sectional approach used in the research limits observations to a single point in time, restricting insight into the progression and fluctuations in LUTS. Longitudinal studies are suggested to track symptoms over time, providing an improved understanding regarding how LUTS develops over adolescence and early adulthood. Differences in how participants perceive, and report symptoms may impact the comparability of findings. Despite using the well-known ICIQ-FLUTS questionnaire to standardize reporting, variability continues to remain a potential a limitation. Future research should include participants training to ensure unified understanding of symptom terminology, hence increasing information dependability. While our included residence background as an indicator, one did not investigate socioeconomic status, lifestyle, or environmental factors, each of which might have an important effect on LUTS patterns.

Further studies might include these elements to provide an improved understanding. Expanding the sample size along with standardized reporting of symptoms and clinical assessments is essential for improving the validity and accuracy of findings. We suggest that future investigations with larger and more varied sample sizes improve the findings' generalizability. Longitudinal studies that monitor the symptom's development over time could yield more comprehensive insights into LUTS. In addition, using standardized reporting methods for symptoms may help reduce response discrepancies and improve data accuracy.

Conclusion

The study highlights the high prevalence of LUTS among adolescents and young females and differences in LUTS among different demographics in Eastern UP. Nocturia and urgency are observed more frequently in late adolescence than in early adolescence. Findings indicate the frequency of symptoms increases with age. The urban population experienced more LUTS than the rural populations. Religious beliefs also affect the prevalence of these symptoms. Larger-scale longitudinal studies can yield more comprehensive insights into LUTS and in the planning of early targeted bladder health awareness and prevention protocols.

Author's contributions

Research concept and design: Kumar L, Agarwal S, and Kumari Aruna; Collection and/or assembly of data: Thakur A and Das A; Data analysis and Interpretation: Singh T B and Das A; Writing the article: Thakur A, Agarwal S; Editorial oversight and Formatting: Kumar L; Critical revision of the article: Kumar L, Agarwal S, Singh T B and Kumari Aruna.

Ethics considerations

The Institutional Ethics Committee approved and registered the study under the reference number (ECR/526/Inst/UP/2014/RR-20). The committee was informed about the research objectives, design, and possible impact.

Acknowledgment

We appreciate the Institutional Ethics Committee authorizing and providing the necessary approval to conduct the study.

Abbreviations

LUTS, Lower Urinary Tract Symptoms; ICS, International Continence Society; OAB, Overactive Bladder; ICI, International Consultation on Incontinence; ICIQ-FLUTS, International Consultation on Incontinence Modular Questionnaire on Female Lower Urinary Tract Symptoms; SPSS, Statistical Package for the Social Sciences

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Conflicts of interest

There are no conflicts of interest.

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