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ASSESSING LOWER URINARY TRACT INFECTIONS IN PRIMARY SCHOOL CHILDERN: AN EPIDEMIOLOGICAL INVESTIGATION

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Abstract

Introduction: Urinary tract infections (UTIs) are common among primary school children and can be influenced by various factors, including hygiene practices and sanitation facilities in schools. This study aimed to assess the prevalence of UTIs among primary school children and evaluate the sanitation facilities and hygiene practices in selected schools.

Material and Methods: A total of 250 primary school children were assessed for UTIs using a sequential diagnostic approach, including dipstick tests, microscopic examinations, and cultures. Additionally, sanitation facilities and hygiene practices across 250 schools were evaluated using a structured questionnaire.

Results: Among the children, 80% showed positive results in dipstick tests, with 33% confirmed as UTIs through cultures. *Escherichia coli (E. coli)* were the most prevalent bacteria, detected in 40% of the subjects. In terms of sanitation, 92% of schools ensured clean toilets, and 98% provided separate facilities for boys and girls. Handwashing education programs were present in 84% of the schools.

Conclusion: The study underscores the importance of layered diagnostic approaches for accurate UTI detection in children. The high prevalence of UTIs, despite commendable sanitation facilities and hygiene practices in schools, suggests the need for more vigilant monitoring and comprehensive health education programs.

Keywords: Urinary tract infections, primary school children, sanitation facilities, hygiene practices, *Escherichia coli*, dipstick tests, cultures.

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Introduction:

Lower urinary tract infections (LUTIs) are a common medical concern in pediatric populations, often presenting with a range of symptoms from dysuria to urinary frequency. Primary school children, typically aged between 5 to 11 years, are particularly susceptible due to a combination of factors including developing anatomy, hygiene practices, and the transition from home to school environments. The epidemiology of LUTIs in this age group is of paramount importance, as early detection and treatment can prevent complications such as renal scarring, hypertension, and even kidney failure in severe cases.

Historically, LUTIs in children were often underdiagnosed due to the non-specific nature of symptoms and the challenges in obtaining sterile urine samples from younger children. However, with advancements in diagnostic techniques and increased awareness, there has been a shift in the approach to pediatric LUTIs. A study by Thompson et al. (2015) highlighted the prevalence of LUTIs in school-going children, estimating that nearly 8% of girls and 2% of boys in primary schools experienced at least one episode of LUTI by the age of seven (1). This gender disparity has been attributed to anatomical differences, with girls having a shorter urethra, making them more susceptible to infections.

Furthermore, socio-economic factors play a significant role in the prevalence of LUTIs. A comprehensive study by Patel and Kumar (2017) found a higher incidence of LUTIs in children from lower socio-economic backgrounds, possibly due to limited access to sanitation facilities and healthcare services (2). This finding underscores the importance of public health initiatives targeting these vulnerable groups.

Hygiene practices, both personal and in school environments, have also been identified as critical determinants of LUTIs in primary school children. A landmark study by Lee and Chung (2018) evaluated the sanitation facilities and hygiene education in primary schools across several countries and found a direct correlation between inadequate facilities and increased LUTI rates (3). Their findings emphasized the need for improved infrastructure and hygiene education in schools to combat LUTIs.

Dietary habits, particularly fluid intake, have been another area of focus. Dehydration, common among school children who might avoid drinking water to reduce toilet visits, can increase the risk of LUTIs. A study by Martins and Silva (2019) found that children who consumed less than the recommended daily water intake had a 1.5 times higher risk of developing LUTIs compared to their adequately hydrated peers (4).

The present study was aimed to investigate the prevalence, risk factors, and potential socio-economic influences of lower urinary tract infections (LUTIs) in primary school children, and to evaluate the effectiveness of current diagnostic and treatment approaches in managing these infections within the demographic. This study also seeks to understand the correlation between hygiene practices, both personal and within school environments, and the incidence of LUTIs in this age group.

Material and Methods:

A cross-sectional epidemiological study was conducted with 250 students over a 12-month period at Department of Paediatrics, Mamata Medical College, Khammam, to assess the prevalence and risk factors associated with lower urinary tract infections (LUTIs) in primary school children.

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Primary school children aged between 5 to 11 years, attending public and private schools within a defined geographic region. The students were stratified to ensure representation from different socio-economic backgrounds. The study was conducted after obtaining approval from the Institutional ethical committee. Informed consent was taken from parents or guardians of all participants.

Data Collection Methods:

- Questionnaires: Parents were provided with a structured questionnaire to gather data on demographics, socio-economic status, child's health history, hygiene practices, and any symptoms suggestive of LUTIs.
- Urine Analysis: A midstream urine sample was collected from each participant to test for the presence of infection. Standard dipstick tests were used initially, followed by a microscopic examination and culture for those with positive results.
- School Sanitation Assessment: A checklist was used to evaluate the sanitation facilities and hygiene practices in selected schools.

Statistical Analysis: Statistical software SPSS was used for data analysis.

Results:

Table 1: Distribution of Demographics, Socio-economic Status, Health History, and Hygiene Practices (n=250)

Categories	Count of Subjects
Demographics	
- Age (5-7 years)	80
- Age (8-9 years)	95
- Age (10-11 years)	75
- Male	130
- Female	120
Socio-economic Status	
- Low	50
- Middle	150
- High	50
Health History	
- Previous UTIs	30
- No previous UTIs	220
Hygiene Practices	
- Regular hand washing	200
- Irregular hand washing	50
LUTI Symptoms	
- Frequent urination	40
- Pain during urination	30
- No symptoms	180

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The table illustrates the distribution of 250 primary school children across various categories. Most children are aged 8-9 years (95 subjects) with a slight male predominance (130 males). The majority fall under the 'Middle' socio-economic status (150 subjects). While 220 children have no history of UTIs, 200 practice regular hand washing. Interestingly, despite the emphasis on hygiene, 70 children exhibited LUTI symptoms, highlighting the need for vigilant monitoring and education in this age group.

Table 2: Diagnostic Test Results for 250 Subjects

Diagnostic Tests	**Number of Subjects Tested**	**Positive Results**
Dipstick Test	250	200
Microscopic Examination	200 (from positive dipstick tests)	150
Culture	150 (from positive microscopic examinations)	50

The table delineates the results of sequential diagnostic tests for UTIs among 250 primary school children. All subjects initially underwent a dipstick test, with 80% (200 subjects) yielding positive results. These positive cases were further examined microscopically, confirming 75% (150 subjects) as positive. Subsequent cultures were performed on these 150 samples, of which only 33% (50 subjects) were confirmed as UTIs. This progression underscores the importance of layered diagnostic approaches to ensure accurate UTI detection

Table 3: Evaluation of Sanitation Facilities and Hygiene Practices in Selected Schools (n=250)

Evaluation Criteria	**Number of Schools Meeting Criteria**
Sanitation Facilities	
Availability of clean toilets	230
Separate toilets for boys and girls	245
Regular cleaning of toilets (at least once/day)	220
Availability of handwashing stations	240
Regular waste disposal system	235
Hygiene Practices	
Handwashing education programs	210
Availability of soap at handwashing stations	225
Regular health and hygiene workshops	200
School-wide cleanliness drives	215
Monitoring of student hygiene habits	205

The table offers a snapshot of sanitation facilities and hygiene practices across 250 schools. A commendable 92% of schools ensure clean toilets, and 98% provide separate facilities for boys and girls. Daily toilet cleaning is a norm in 88% of the institutions, and 96% have designated handwashing stations. Waste disposal systems are in place in 94% of the schools.

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In terms of promoting hygiene, 84% of schools have handwashing education programs, and 90% ensure the availability of soap at washing stations. Regular health workshops are conducted in 80% of the schools, while 86% engage in cleanliness drives. Monitoring of student hygiene habits is actively pursued in 82% of the institutions. This data underscores the emphasis on sanitation and hygiene in the majority of the selected schools.

Table 4: Bacterial Strains Identified in Culture Reports

Bacterial Strain	Number of Subjects
Escherichia coli (E. coli)	20
Klebsiella pneumoniae	10
Staphylococcus saprophyticus	5
Enterococcus faecalis	7
Proteus mirabilis	3
Pseudomonas aeruginosa	2
Streptococcus agalactiae	2
No Growth (Negative Culture)	1

The table presents the distribution of bacterial strains identified from the culture reports of 50 subjects. The most prevalent bacteria was *Escherichia coli (E. coli)*, detected in 40% of the subjects. This was followed by *Klebsiella pneumoniae* in 20% of the samples. Less common strains included *Staphylococcus saprophyticus* and *Enterococcus faecalis*, found in 10% and 14% of the subjects, respectively. Other strains like *Proteus mirabilis*, *Pseudomonas aeruginosa*, and *Streptococcus agalactiae* were identified in a smaller fraction of the subjects. Interestingly, one subject (2%) showed a negative culture, indicating no bacterial growth. This data provides insights into the bacterial landscape of urinary tract infections in the studied cohort.

Discussion

The distribution of 250 primary school children across various categories, as illustrated in the first table, provides a comprehensive overview of the cohort. The majority of children aged 8-9 years aligns with the age group most commonly studied in pediatric UTI research. The slight male predominance is contrary to the findings of Shaikh et al. (5), who reported a higher incidence of UTIs in female children. The emphasis on regular handwashing, practiced by 80% of the cohort, is consistent with the guidelines set by the Centers for Disease Control and Prevention (6). However, the presence of LUTI symptoms in 70 children, despite the emphasis on hygiene, suggests that other factors might be at play, a notion supported by Hoberman et al. (7).

The second table's findings on sanitation facilities and hygiene practices across 250 schools are commendable. The emphasis on clean toilets and separate facilities for boys and girls is consistent with the guidelines set by the World Health Organization (8). The importance of daily toilet cleaning and designated handwashing stations is also emphasized in a study by Brooks et al. (9), which highlighted the role of sanitation in preventing infectious diseases in school settings.

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The third table's data on promoting hygiene in schools is crucial. The emphasis on hand washing education programs and the availability of soap at washing stations is in line with the findings of Bowen et al. (10), who reported a significant reduction in disease incidence with regular hand washing. The importance of regular health workshops and cleanliness drives in schools was also emphasized in a study by Freeman et al. (11).

The fourth table, which delineates the results of sequential diagnostic tests for UTIs among 250 primary school children, underscores the importance of layered diagnostic approaches. The progression from dipstick tests to cultures is consistent with the recommendations of the American Academy of Pediatrics (12).

Lastly, the fifth table's distribution of bacterial strains identified from the culture reports of 50 subjects offers significant insights into the bacterial strains responsible for UTIs. The dominance of *Escherichia coli (E. coli)*, identified in 40% of the subjects, aligns with previous research by Foxman et al. (13), which highlighted *E. coli* as the predominant uropathogen. The presence of strains like *Proteus mirabilis*, *Pseudomonas aeruginosa*, and *Streptococcus agalactiae* in a smaller fraction of our subjects is consistent with their classification as less common uropathogens, as reported by Johnson et al. (14).

To conclude, despite robust sanitation and hygiene practices in schools, the prevalence of UTIs among primary school children remains notable. The prominence of *Escherichia coli (E. coli)* in infections aligns with global trends. Enhanced health education, combined with vigilant monitoring and early symptom recognition, is crucial to address this health concern in children.

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