

## Clinical Presentation, Culture and Sensitivity Pattern of Urinary Tract Infection

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**Background:** The incidence and prevalence of Urinary Tract Infection (UTI) vary in different parts of the world. There is limited data available on pediatric UTI in Bahrain. The diagnosis depends on clinical suspicion and urine culture sensitivity.

**Objective:** To evaluate the most common presentations and most common organisms in UTI in different age groups. In addition, to evaluate the appropriate empirical antibiotic therapy.

**Design:** A Retrospective Study.

**Setting:** Emergency Medicine Department, King Hamad University Hospital, Bahrain.

**Method:** One hundred four children diagnosed with UTI from July 2015 to July 2016 were included in the study. Children were divided into three groups according to age; group 1 (>1 month to <1 year), group 2 (1 year to <5 years) and group 3 (5 years to 14 years). Clinical presentation, sampling technique and organisms causing UTI with sensitivity and resistance pattern were documented.

**Result:** One hundred four children with culture-positive UTI were included in the study. Fever, 67 (64.4%), was the most common symptom followed by vomiting, 49 (43.3%), and abdominal pain, 45 (28.8%). In groups 1 and 2, fever was the most common presentation, 16 (84%) and 24 (61.5%), respectively. Abdominal pain was the most common symptom in group 3, 33 (71.7%). Thirty-six (34.6%) had UTI caused by *E. coli* followed by 31 (29.8%) caused by *E. coli* ESBL. Five (4.8%) were caused by *Pseudomonas* (4.8%) and 4 (3.8%) by *Klebsiella*. Among the empirical antibiotics used, Cefuroxime was found to be more sensitive than Augmentin against *E. coli*. Fifty-four (51.9 %) of the urine samples were collected by mid-stream clean catch.

**Conclusion:** The most common UTI symptoms were fever, vomiting and abdominal pain. UTI was more common in females than males. *E. coli* is the most common organism cultured in urine samples. Cefuroxime is more sensitive against *E. coli* than Augmentin.

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UTI is one of the most common community-acquired infections in children presenting with febrile illness. Its clinical presentation varies with age. Infants may present with fever, irritability or vomiting, whereas children under 5 years of age typically present with lower abdominal pain. However, children above 5 years typically present with difficult and painful urination, similar to adults. Therefore, its diagnosis is difficult in children due to the non-specific symptoms<sup>1</sup>. The diagnosis and treatment of UTI is usually achieved according to the NICE guidelines and criteria<sup>2,3</sup>. The incidence and prevalence of UTI vary in different parts of the world. There is limited data available on pediatric UTI in Bahrain. The diagnosis depends on clinical analysis and urine culture sensitivity after a clean catch urine sample, which is the most difficult task in children, especially those under 4 years of age. Special caution is needed when collecting a clean catch sample of urine and labelling as UTI before commencing empirical antibiotics<sup>4</sup>. One of the common practices among pediatricians is the use of a urine dipstick and urine complete examination followed

by an empirical antibiotic therapy<sup>5</sup>. If culture is positive, a change of the antibiotic, according to the sensitivity, is needed. Sometimes, a clean catch sample could not be collected. It is always challenging for a physician when the pathological tests are suggestive of infection but the symptoms are not<sup>3</sup>. Therefore, it is always important to have certain clinical parameters and supportive labs to start antibiotics in children with suspected UTI<sup>6</sup>. There is also a need to identify the common organisms in our own community that cause UTI and its sensitivity in order for guidelines to be formulated for the better treatment and outcome of this treatable disease.

Gram-negative *E. coli* is the most common organism causing UTI worldwide and its sensitivity varies in different parts of the world<sup>7,8</sup>.

The aim of this study is to evaluate the most common presentation and most common organism of UTI in the different age groups. In addition, to evaluate the appropriate empirical antibiotic therapy.

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**METHOD**

One hundred four children were seen from July 2015 to July 2016 and were included in the study. The patients were randomly selected. The exclusion criteria were as follows: above 14 years of age, structural urological anomalies, already diagnosed cases of UTI and children with a long history of antibiotic therapy. All the children below 14 years of age with a diagnosis of UTI, fever of unknown origin, urinary complaints, vomiting with or without fever and abdominal pain were included in this study. The children were divided into three groups according to the age; group 1 (>1 month to <1 year), group 2 (1 year to <5 years) and group 3 (5 years to 14 years). Medical history, personal characteristics and clinical presentation were documented. Nitrites, leukocyte esterase, leukocytes and white blood cells in urine were documented.

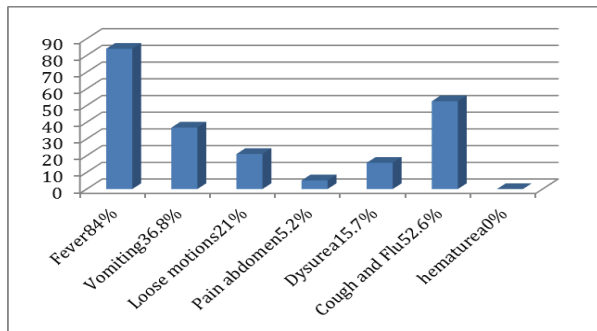
Patients' data were entered into Microsoft Excel sheets. The data were analyzed to compute mean and standard deviation using SPSS (version 20). Frequency distribution was generated for categorical parameters and percentages were calculated.

**RESULT**

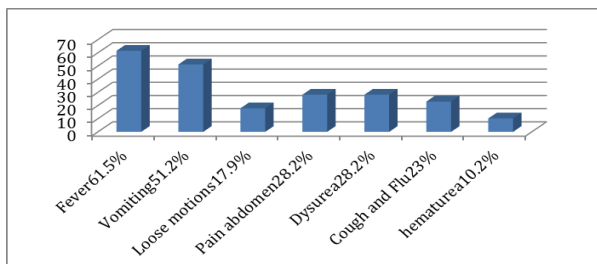
One hundred four children with culture-positive UTI were included in the study. The average age was 5.58±3.54. Eighty-eight (84.6%) were females and 16 (15.4%) were males. Nineteen (18.2%) were less than 1 year of age, while 39 (37%) were 1-5 years of age and 46 (44.2%) were above 5 years of age.

Sixty-seven (64.4%) had fever followed by vomiting in 49 (47.2%) and abdominal pain in 45 (43.3%). Dysuria and cough or flu were found in 30 (28.8%) and 27 (25.9%) children, respectively. Loose motions and hematuria were found in 12 (11.53%) and 10 (9.6%) children, respectively.

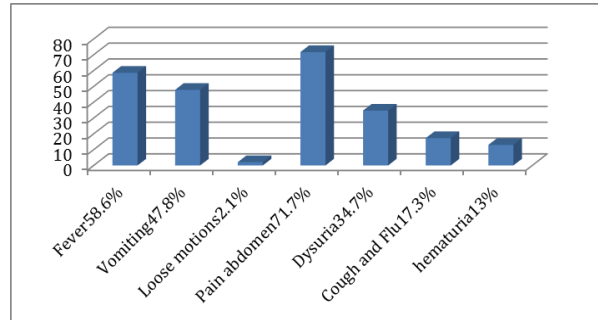
In groups 1 and 2, fever was the most common presentation, 16 (84%) and 24 (61.5%), respectively; abdominal pain was the most common symptom in group 3, 33 (71.7%). Fifty-four urine samples were collected by mid-stream clean catch method, see figures 1, 2 and 3.



**Figure 1: Most Common Presentations in Group 1**



**Figure 2: Most Common Presentations in Group 2**



**Figure 3: Most Common Presentations in Group 3**

**Table 1: Cultured Organisms in UTI Children**

Cultured Organisms	Frequency (n)	Relative Frequency (%)
<i>Enterobacter aerogenes</i>	1	1.0
<i>Streptococcus agalactiae</i> (GBS)	2	1.9
<i>Klebsiella pneumonia</i>	4	3.8
<i>E. coli</i>	36	34.6
ESBL <i>E. coli</i>	31	29.8
<i>Serratia</i>	1	1.0
<i>Staphylococcus aureus</i>	1	1.0
<i>Proteus mirabilis</i>	1	1.0
<i>Enterobacter cloacae</i>	2	1.9
Mixed growth	7	6.7
Insignificant/no growth	13	12.5
<i>Pseudomonas aeruginosa</i>	5	4.8
<b>Total</b>	<b>104</b>	<b>100.0</b>

The detailed summary of cultured organisms is given in table 1. The majority of the urine cultures had *E. coli* and ESBL *E. coli*, 36 (34.6%) and 31 (29.8%), respectively. A detailed summary of Augmentin and Cefuroxime sensitivity and resistance by cultured organism is seen in tables 2 and 3.

**Table 2: Augmentin Sensitivity by Cultured Organisms**

Cultured Organism	Sensitive	Resistant	Not applied	Total
<i>Enterobacter aerogenes</i>	0	1	0	1
<i>Streptococcus agalactiae</i> (GBS)	1	1	0	2
<i>Klebsiella pneumonia</i>	2	2	0	4
<i>E. coli</i>	19	17	0	36
ESBL <i>E. coli</i>	0	31	0	31
<i>Serratia</i>	0	1	0	1
<i>Staphylococcus aureus</i>	1	0	0	1
<i>Proteus mirabilis</i>	0	1	0	1
<i>Enterobacter cloacae</i>	0	2	0	2
Mixed growth	0	1	6	7
Insignificant/no growth	0	0	13	13
<i>Pseudomonas aeruginosa</i>	0	5	0	5
<b>Total</b>	<b>23</b>	<b>62</b>	<b>19</b>	<b>104</b>

**Table 3: Cefuroxime Sensitivity by Cultured Organisms**

Cultured Organism	Sensitive	Resistant	Not applied	Total
<i>Enterobacter aerogenes</i>	0	1	0	1
<i>Streptococcus agalactia</i> (GBS)	0	2	0	2
<i>Klebsiella pneumoniae</i>	3	1	0	4
<i>E. coli</i>	27	9	0	36
ESBL <i>E. coli</i>	0	31	0	31
<i>Serratia</i>	0	1	0	1
<i>Staphylococcus aureus</i>	0	1	0	1
<i>Proteus mirabilis</i>	0	1	0	1
<i>Enterobacter cloacae</i>	0	2	0	2
Mixed growth	0	1	6	7
Insignificant/no growth	0	0	13	13
<i>Pseudomonas aeruginosa</i>	0	5	0	5
<b>Total</b>	<b>30</b>	<b>55</b>	<b>19</b>	<b>104</b>

## DISCUSSION

In our study, fever was the most common presentation of UTI in young children, whereas abdominal pain was predominant with increasing age. Vomiting, cough, flu, and dysuria were other major presenting symptoms. UTI is a well-known cause of fever among young children<sup>9-11</sup>. Other studies revealed a strong association of these symptoms with UTI<sup>11-13</sup>. Studies found UTI to be the major cause of abdominal pain in approximately 50% of cases<sup>12-14</sup>.

Clinical presentation plays a crucial role in UTI diagnosis. Even if the clinical presentation is prominent, urine culture and sensitivity is still essential to diagnose UTI. In our study, urine analysis revealed microscopic hematuria in 10% of the children. Similar findings were observed in other studies<sup>9,13</sup>. In addition, females were more affected with UTI, which could be due to the short urethra. This finding was supported by other studies where the female to male ratios were 1.9:1<sup>9,14</sup>. In our study, the female to male ratio was 5:1.

The most common age among children with UTI in our study was between 5 to 14 years; it was in contrast with other studies<sup>12,15</sup>. In our study, the majority of the microorganisms were gram-negative, the predominant was *E. coli*. Other studies revealed similar results<sup>12,18,19</sup>. In our study, *Klebsiella* spp. accounted for 3-5%, which is similar to other studies<sup>14,16</sup>.

In our study, *E. coli* revealed the sensitivity of above 18% to Augmentin and 25% to Cefuroxime. Antibiotic susceptibility patterns in other studies revealed that *E. coli* was more than 80% sensitive to Nitrofurantoin and Cefotaxime<sup>17,18</sup>. *E. coli* was highly resistant to Ampicillin as well as Co-trimoxazole, whereas the resistance of *E. coli* was 16% and 11% to Augmentin and Cefuroxime<sup>19,20</sup>.

## CONCLUSION

**The most common UTI presentations were fever, vomiting and abdominal pain. However, UTI patients could also present with cough and flu. UTI was significantly higher in females than in males. The most common organism cultured in urine sample was *E. coli*. Cefuroxime was found to be more sensitive compared to Augmentin.**

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(2) drafting the article and revising it critically for important intellectual content; and (3) final approval of the manuscript version to be published. Yes.

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**Competing Interest:** None.

**Sponsorship:** None.

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