

## Prospective study to evaluate the incidence of UTI in febrile infants and children < 5 years without focus of infection

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**Abstract:** *Introduction:* Among febrile infants and young children with UTIs, 75% have pyelonephritis, with consequences that, if missed, include renal scarring in 27-64% of patients, a 23% risk of hypertension, a 10% risk of renal failure, and a 13% risk of preeclampsia as adults. Approximately 13-15% of end-stage renal disease is believed to be related to undertreated childhood UTIs. As a result it is crucial to have high index of suspicion of UTI in febrile child without focus, also to have clear knowledge about pathogenesis, risk factors, indications for diagnostic tests and appropriate uses of antimicrobial agents in management of children with UTI. *Materials & Methods:* A hospital based observational prospective study was done at the Department of Paediatrics, Al Ameen Medical College & Hospital, during May 2015 to May 2016 and about 100 children were randomly selected between age group one month to 5 years who attended OPD or admitted with history of fever without obvious focus of infection. *Results:* A total of 100 cases of febrile children without any focus of infection between 1 month - 5 years were studied. Out of them there were 56 boys and 44 girls with mean age being 22.5 months and 23.1 month respectively. Male to female ratio in study population is 1.12:1. *Conclusion:* 17 cases out of 100 were diagnosed to have UTI (urine culture positive cases) fulfilling the inclusion criteria there by showing incidence rate of 17%.

**Keywords:** Child, Fever without focus, Incidence, Infant, Urinary Tract Infections.

### Introduction

UTI constitutes one of the most common source of fever in febrile child without focus [1-2]. The febrile infant or child with clinically significant bacteriuria and no other site of infection to explain the fever, even in the absence of systemic symptoms, has pyelonephritis [3]. UTI in infants and young children is usually under diagnosed due to vague symptoms and lack of specific signs [4]. Young children are at higher risk for renal injury than older children because of delay in diagnosis and start of antibiotic therapy [5]. This situation has led to a 3 day rule; An infant or child with unexplained fever should not be observed for more than three days without a urine specimen being obtained [6].

Among febrile infants and young children with UTIs, 75% have pyelonephritis, with consequences that, if missed, include renal scarring in 27-64% of patients, a 23% risk of hypertension, a 10% risk of renal failure, and a 13% risk of preeclampsia as adults [1].

Approximately 13-15% of end-stage renal disease is believed to be related to undertreated childhood UTIs [1]. As a result it is crucial to have high index of suspicion of UTI in febrile child without focus, also to have clear knowledge about pathogenesis, risk factors, indications for diagnostic tests and appropriate uses of antimicrobial agents in management of children with UTI [3].

### Aims and Objectives

*Primary Objective:* To find out incidence of UTI in febrile infants and children < 5 years without focus of infection.

### *Secondary Objectives:*

1. To study bacteriological and antibiotic sensitivity pattern in children of same population.
2. To know gender difference in the incidence of UTI in same population.
3. To study the incidence of Extended Spectrum Beta Lactamase (ESBL) production among urinary isolates.

**Material and Methods**

*Study Design:*

- A hospital based observational prospective study was done at the Department of Pediatrics, Al Ameen Medical College & Hospital, during May 2015 to May 2016.
- 100 children were randomly selected between age group one month to 5 years who attended OPD or admitted with history of fever without obvious focus of infection.
- Ethical clearance was obtained from Al Ameen Medical College & Hospital ethics committee.

*Inclusion Criteria:*

- Children with history of fever without obvious focus of infection.
- Age criteria: 1month -5 years.

*Exclusion Criteria:*

- Children with focus of infection like cough, cold, pharyngitis, otitis media and burning micturition.
- Neonates.
- Child with lab evidence of malaria and typhoid, pneumonia by chest x-ray, meningitis by CSF count.

*Method of Sample Collection:* About 60 % of sample were mid stream void, 30% were urethral catheterization and 10% were suprapubic aspiration.

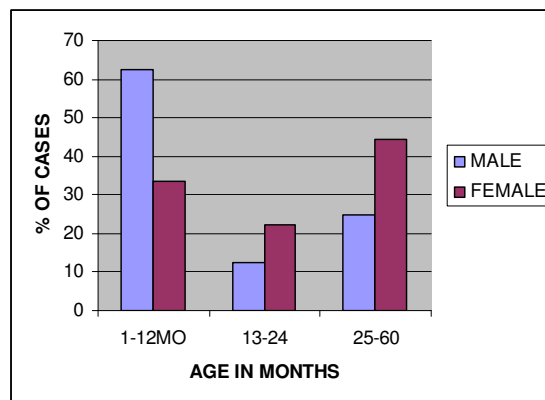
**Results**

Definition of positive/negative urine culture depending on method of urine collection according to the chart below:

Method of collection	Colony counts/ml	Probability of infection (CFU/ml)
Suprapubic aspiration	Any number	99%
Urethral catheterization	>10 <sup>5</sup>	95%
	10 <sup>4</sup> -10 <sup>5</sup>	Very likely
	10 <sup>3</sup> -10 <sup>4</sup>	Suspicious,repeat
Mid stream void	<10 <sup>3</sup>	Unlikely
	>10 <sup>4</sup>	Very likely
	>10 <sup>5</sup>	90-95%
Boy	10 <sup>4</sup> -10 <sup>5</sup>	Suspicious,repeat
Girl	<10 <sup>4</sup>	Unlikely

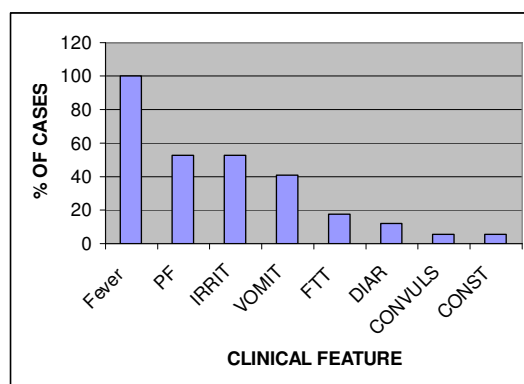
Sl. No	Age Groups (MO)	Male N (%)	Female N (%)	Total N (%)
1	1-12	5 (62.5%)	3 (33.33%)	8 (47.05%)
2	13-24	1 (12.5%)	2 (22.22%)	3 (17.65%)
3	25-60	2 (25%)	4 (44.45%)	6 (35.29%)
<b>Total</b>		8 (100%)	9 (100%)	17 (100%)

**Fig-1:** Age and sex distribution of UTI (N=17)



Sl. No	Clinical Feature	Number of Cases	%
1	Fever	17	100
2	Poor Feeding	9	52.94
3	Irritability	9	52.94
4	Vomiting	7	41.17
5	FTT	3	17.64
6	Diarrhoea	2	11.76
7	Convulsion	1	5.88
8	Constipation	1	5.88

**Fig-2:** Clinical Profile of UTI (N=17)

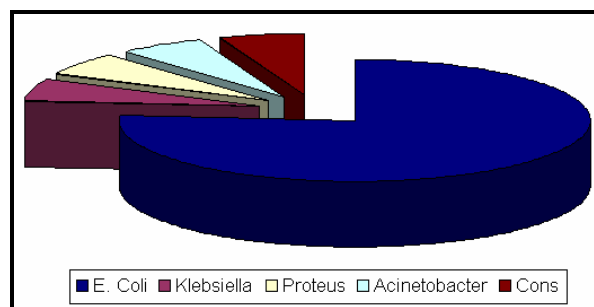


(PF-Poor feeding, IRRIT-Irritability, VOMIT-Vomiting, FTT-Failure to thrive, DIAR-Diarrhoea, CONVULS-Convulsion, CONST-Constipation)

Fever was consistent in all patients (100%) followed by poor feeding, irritability each (52.94%) and vomiting (41.17%) cases. FTT seen in 3 cases (17.64%), followed by diarrhea in 2 cases (11.76%). One child had constipation (5.88%). One child had phimosis and no male children were circumscribed among urine culture positive cases. Also no female children had vaginal synechiae among urine culture positive cases.

Sl. No	Organism	Numbers	%
1	E. Coli	13	76.47
2	Klebsiella	1	5.88
3	Proteus	1	5.88
4	Acinetobacter	1	5.88
5	Cons	1	5.88
<b>Total</b>		<b>1</b>	<b>100</b>

**Fig-3: Organisms Causing UTI**



(KLEBSIELLA-Klebsiella pneumoniae, PROTEUS-Proteus mirabilis, CONS-Coagulase negative staphylococcus) 94.11% organisms isolated were gram negative and one child had CONS (5.88%) growth. Among gram negative organisms E.coli constituted 76.47% followed by Klebsiella and Proteus each 5.88%. Out of 13 E.coli UTI cases 7 (53.84%) were ESBL producers followed by Klebsiella.

Sl. No	Sex	No	E. Coli	%
1	Female	9	8	88.88
2	Male	8	5	62.5
<b>Total</b>		<b>17</b>	<b>13</b>	

## Discussion

In developing countries urinary tract infections (UTI) constitute the third most common infections in children after gastrointestinal and respiratory infections. UTI constitutes most common source of fever in febrile child without focus. Because of nonspecific signs and vague symptoms in young children they may remain unrecognized. Therefore clinical suspicion is paramount in early recognition and prompt therapy. The present study is prospective study conducted from May 2015 – May 2016. In present study 100 febrile children without focus of infection aged more than 1 month-5 years enrolled.

*Percentage:* The overall percentage of urine culture positive cases in febrile children without focus in the present study is 17%. Of various studies that quote prevalence of UTI in febrile children without focus, Kenneth B et al [2] 10%, Morris CM et al 9.6% and Musa Aisien et al [3] suggests a prevalence of 9%. The high prevalence in our study could be due to high index of suspicion, increased recognition of UTI as a potential source of febrile illness in young children, increased awareness among parents and improved laboratory methods.

*Sex ratio:* The M:F ratio in this study was 1:1.12 showing higher prevalence in female patients. This is in concordance with another study Jungthirapanich et al (1:1.4) [7]. Heavy periurethral colonisation often associated with perineal contamination following gastroenteritis and the anatomy of perineum, relatively short urethra explains the higher incidence of UTI in female children.

*Age prevalence:* The study cases were maximum in first 2 years of life, more so in 1<sup>st</sup> year of life (47.05%). This coincides with results of other studies Junghirapanich J et al (40%) [7] and Ditchfield et al (49.7%) [8].

*Clinical profile:* Fever was consistent in all patients followed by poor feeding, irritability each (52.94%), vomiting (41.17%) cases and FTT in 3 cases (17.64%). Present study results match other studies like Naseri M et al [9] (FTT -9.3%, Constipation 5.6%), Allan R et al

[10] (Poor feeding - 36%), Roberts JA et al [11] (Vomiting-38%) and Shaw KN et al [12] (Irritability 43%, Diarrhoea 8%). High index of clinical suspicion was necessary in infants and young children where symptoms were nonspecific.

*Urine microscopy in UTI:* Present study showing sensitivity and specificity of Urine microscopy (pyuria) 76.47% and 87.95% respectively similar with other studies Smellie JM et al [13] (sensitivity 73% and specificity 81%).

*Organisms causing UTI:* E.COLI found to be the most common organism in present study. *ESBL production:* High prevalence rate of ESBL

producing strains reported in various studies. The present study showed 47.05%, while Jabeen K et al [14] showed 40% and Supriya S et al [15] showed 48.3% ESBL production. The prevalence of ESBLs is increasing and ranging between 9-50%. The higher prevalence of ESBLs in our study could be due to immense use of cephalosporins in community practice. Hence with increasing prevalence of ESBLs routine testing of all cultures for ESBL production can be recommended. Wide spread use of 3<sup>rd</sup> generation cephalosporin is believed to be the major cause of mutations in these enzymes that has lead to emergence of ESBLs.

<b>Clinical parameter</b>	<b>BaraffJ [5] %</b>	<b>Naseri M et al [9] %</b>	<b>Roberts JA et al [11] %</b>	<b>Shaw KN et al [12] %</b>	<b>Allan R et al [10] %</b>	<b>Present study %</b>
Fever	100	-	-	-	-	100
Poorfeeding	-	-	-	-	36	52.94
Irritability	-	-	-	43	-	52.94
Vomiting	-	-	38	-	-	41.17
FTT	-	9.3%	-	-	-	17.64
Diarrhoea	-	-	-	8%	-	11.58
Constipation	-	5.6%	-	-	-	5.88

**Summary**

- 17 children from both sexes out of 100 were culture positive (17%).
- There was female preponderance with 52.95% (9 cases) and 47.05% males (8 cases)
- Only during infancy male children had higher incidence of UTI with M:F ratio 1.66:1. After infancy the ratio reversed with female preponderance.
- Even though fever was present in all cases, symptoms were non specific in younger children (less than 2 years age). So urine C/S should be sent in all febrile children without an obvious source
- Blood counts were abnormal in 76.17% cases. (Leucocytosis in 41.17% and leucopenia in 35% cases.)
- Urine microscopy showed pyuria in 76.47% with sensitivity and specificity being 76.47% and 87.95% respectively.

- Gram negative infections were seen in 94.11% (16 cases) and one child had CONS growth (5.88%). Out of which E.coli was predominant organism (76.6%).
- Percentage of ESBL producing organism is 47.05%, which is significant.
- E. coli followed by Klebsiella were predominant organisms producing ESBLs.
- Carbapenems, Amikacin and Nitrofurantoin found to be sensitive antibiotics for all organisms except CONS.
- Renal and bladder USG abnormalities were seen in 17.64% cases.

**Conclusion**

- There is a significant incidence of UTI in febrile children without focus. So urine C/S should be sent in all febrile children without obvious source.

- UTI was more common in less than 2 year age group in febrile children without focus.
- UTI was more in males in less than 1 year age group.
- UTI can present with varied clinical manifestations, which may be very non specific like fever, poor weight gain, irritability and vomiting.
- Even though Urine microscopy (pyuria) is not gold standard for UTI it can be recommended as sensitivity and specificity being 76.47% and 87.95% respectively in present study.
- UTI is caused by many organisms but E.Coli being most common organism.
- Most of the bacteria developed antibiotic resistance which may be due to indiscriminate use of common antibiotic drugs.
- Incidence of ESBL producing organisms is increasing. So it is worth to do ESBL testing along with conventional antibiogram to prevent treatment failures and development of drug resistance.
- Among all antibiotics Amikacin, Nitrofurantoin, Meropenem and Imipenem are more sensitive.
- Parents should be educated about importance of UTI, their long lasting and damaging effects on urinary tract in the form of development of hypertension, renal insufficiency, ESRD and also need for renal transplantation.

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