

Urinary Tract Infection in Febrile Children Attending OPD at Seti Zonal Hospital

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ABSTRACT

Background: Urinary tract infection is a common problem in febrile children. It is dangerous because it may lead to a life-threatening episode or may lead to renal scarring. Recurrence of UTI is common in children. Though it is a serious problem, it is treatable if diagnosed early.

Methods: A total of 340 urine samples from pediatric patients attending pediatric OPD were sent for culture after medical history taking, physical examination and counselling parents/guardians/children. Besides fever other presenting complains were noted.

Results: In total there were 340 samples, 127 (37.35%) samples were culture positive showing isolated bacterial growth and 53 (15.6%) showed mixed bacterial growth in the culture. Out of 127 culture positive urine samples, 51.2% showed growth of *E. Coli*, followed by *Proteus* spp. and *Streptococcus fecalis*. Other less common bacteria were *Klebsiella*, *Staphylococcus* and *Enterobacter* spp. More than half 75(59.05%) of the children were male and only 52(40.95%) were female. Similarly, male children (59.06%) were affected more than female children (40.94%). Apart from fever, 72 (56.7 %) of the children were presented with the symptoms of feeding problems, 68 (53.5 %) were presented with pain abdomen, and 65 (51.2 %) were presented with vomiting. Less typical presenting symptoms of the children with UTI were screaming attacks/irritability (37.8 %), dysuria (30.0%) and frequency of urination (24.4 %). Similarly, non-specific symptoms like diarrhoea, failure to thrive, and convulsion were present in few children and none of the children had enuresis and loin pain.

Conclusion: Prevalence of UTI was more in male than in female children and *E. coli* was found to be the most common bacteria causing it. Besides fever, feeding problems, pain abdomen, and vomiting were the major presenting symptoms of morbidity in children with UTI. Although UTI is rarely a

difficult problem, for the accurate diagnosis of UTI in children attention should be paid during the history taking and collection of the urine sample.

Keywords: UTI, Febrile, Fever, *E. coli*, Infection, Children, Nepal

INTRODUCTION

Urinary tract infection (UTI) is common problem in day-to-day practice¹. The incidence varies according to age and sex. During the first 12 months of life, males are more affected than females due to presence of colonized bacteria in the uncircumcised penis². Beyond 1-2 years of age, female are at higher risk than male throughout the life because female urethra is shorter than male and hence, it provides the easy access to the pathogens to the urinary bladder. Moreover, prostatic fluid in male provides the unfavorable environment for the growth of bacteria in the lower urinary tract. UTI in childhood is dangerous because it may lead to life threatening episodes of septicemia or may develop renal scarring following vesico-ureteral reflux². Recurrence of UTI is common in childhood. Though it is a serious problem, it is treatable if diagnosed early. The aim of this study was to find out the burden of UTI in children with fever and to find out common presenting complains besides fever, also to reinforce the importance of UTI because early detection and adequate treatment not only reduces the morbidity but also reduces the mortality.

Fever is one of the common manifestations of UTI. Overall 3%-5% of febrile children have UTI³. Other presenting symptoms of UTI are variable and often misleading for the clinician. Most of the time symptoms are not localized to genitourinary tract so there is high chance of missing cases of UTI unless specifically looked for. Irritability, lethargy, poor feeding, failure to thrive, diarrhea, vomiting, jaundice, offensive or cloudy urine, convulsion are often noted. Older children have more adult pattern of symptoms like fever associated with chills and rigor, pain abdomen, loin pain, vomiting, frequency of micturition, dysuria, urgency, incontinence, enuresis, smelly urine, red colored urine or blood in urine^{2,3}. All symptoms suggestive of UTI will not actually prove bacterial infection. Anatomical abnormalities

providing voiding discomfort, irritation of external genitalia, viral hemorrhagic cystitis are the few examples. So, a diagnosis of UTI cannot be made on symptomatology alone⁴. Hence, any child with history of fever, urine should be examined.

Diagnosis of UTI is done by urine examination⁵. A positive urine culture is the gold standard test for the diagnosis of UTI⁶. One of the major difficulties in diagnosis and management of childhood UTI is collection of contaminated sample of urine for the laboratory test which results in mixed growth of the organism in the urine sample. Another difficulty in the diagnosis and management of childhood UTI is that children are not able to express their symptoms clearly to clinician⁷. Various literatures are available suggesting the diffident reliable method of collection of urine sample from child for the laboratory diagnosis^{3,5,8}. Following methods of urine collection is regarded as the standard method for the proper collection of uncontaminated urine sample:

1. **Clean catch mid-stream urine:** In the elder children who can cooperate and void on command, mid-stream urine specimen is taken after proper local cleaning and drying of the genital area. In girls the labia should be separated whereas in boys the prepuce should be retracted before the collection of urine sample. The initial part of urine, which may still be contaminated with periurethral bacteria, is discarded. However in the younger children, their parent has to be instructed properly for the sample collection. Best time to attempt urine collection is after the infant has been fed or wakes up after sleep. Stroking the spine and tapping the bladder area can promote bladder emptying. It is always wise to have a sterile container to hand when opening up a baby's nappy.

2. **Bag collection:** The most convenient method of obtaining urine samples in neonates and infants is by applying a sterile urine collection bag to genital area. Cleaning and drying of the area should be done before applying the bag. Urine bag should be removed immediately once the baby has voided the urine. The urine specimen is then collected in sterile container. Even though there is high risk of contamination of the urine sample, a negative culture helps to exclude UTI. Even if bag specimen gives a positive result, it is better to confirm it by examining a specimen obtained by suprapubic aspiration of the urinary bladder if it is possible.
 3. **Supra-pubic bladder aspiration (SPA):** This method of urine collection for culture is considered very reliable, simple to perform and gold standard for diagnosis of UTI in infants. The bladder is intra-abdominal organ in young infants. Hence, urinary bladder is easily accessible to puncture for the collection of urine sample. In trained hand, it is a quick and safe method. The urinary bladder should be filled with good amount of urine before planning the SPA which is confirmed by percussion. A 5-10 ml syringe with a thin needle is vertically inserted 1-2 cm above the pubic bone. Aspiration of urine in the syringe confirms that the needle is in the right place.
 4. **Bladder catheterization:** It is reliable method of collection of urine sample with proper technique only. This method is generally not employed unless other methods have failed. There is risk of urethral trauma and ascending infection if great care is not taken. It is relatively easy in girls in comparison to boys.
- Gulati and Kher in 1996 have given comparative utility of various methods of collection of urine for culture¹ which is tabulated below in table 1.

Table 1: Comparison of various methods of urine sample collection

Method of collection	Reliability of specimen	
	< 4 years age	>4 years age
Clean catch mid-stream urine	Unreliable because of difficulty of collection	Reliable when collection is properly obtained Method of choice
Catheterization	Reliable with proper techniques Relatively easy in girls Require care in males to avoid urethral trauma	Reliable with proper techniques Helpful if adequacy of midstream specimen is questionable
Supra-pubic aspiration (SPA)	Very reliable, simple to perform, gold standard for diagnosis in infants,	Very reliable, simple to perform
Collection bag (CB)	Most prone to contamination; Culture has value	Not recommended

After the collection of urine sample, it is cultured in laboratory. A positive urine culture is the gold standard test for the diagnosis of UTI. More than 10⁵ colony forming unit (CFU)/ml of urine is taken as significant bacteriuria⁸. Negative culture is one that has no bacterial growth or no significant bacterial growth⁹. Urine in bladder of healthy person is sterile, but it acquires organisms of the normal flora

as it passes through the distal portion of urethra. To avoid these organisms, a mid-stream urine sample is collected after washing the external orifice which is used for urine cultures. In special situations, supra-pubic aspiration, catheterization and collection bag method may be applied to obtain a reliable sample of urine. The culture of the collected urine sample should be done within one hour after collection as

urine is a good culture medium for bacteria, If urine culture cannot be done within one hour, it is essential to store the urine sample in refrigerator at 4°C¹⁰. Urine obtained for culture by midstream techniques when kept in refrigerator at 4°C the bacterial count will remain static for up to 24 hours. Urine obtained by bladder puncture and held in an adequately sealed syringe will remain sterile for longer than 24 hours at 4°C⁷.

METHODOLOGY:

This study was a cross-sectional study, carried out at Seti Zonal Hospital, Kailali district, Dhangadhi from February 2017 to July 2017 for period of 6 months. All the patients (from the age of 3 months to 15 years) presenting to the pediatric OPD with the history of fever were enrolled in this study. Neonates and infants up to the age of 3 months were not included in the study because septicemia commonly accompanies infection of the urinary tract during this period². Additionally the children or their guardians who were not willing for the investigations were excluded from the study. The ethical approval was taken from the hospital authority. The parents or guardians of the child were counseled and verbal as well as written consent was taken before the study.

History and physical examination were done. A clear instruction for the collection of MSU samples was given to the parents or guardians before collection of urine sample. The parents were requested to wash the child's external genitalia with soap and water, drying with clean dry gauze piece before collection of the urine sample in a sterile container provided by the laboratory. For children above 10 years of age were taught to collect the samples properly. The containers with the urine sample were immediately transferred to laboratory for bacterial culture. Significant bacteriuria was defined as $>10^5$ colony forming units (cfu)/

ml of urine of a single pathogen. Samples showing mixed bacterial growth were excluded from the study. A total of 340 samples were collected and analyzed in the laboratory for the bacterial growth.

RESULTS

In total there were 340 samples, out of them where as 160 (47.06%) urine samples didn't show any bacterial growth. Remaining 127 (37.35%) samples were culture positive showing isolated bacterial growth and 53 (15.6%) showed mixed bacterial growth in the culture (table 1 and figure 1).

Table 2: Laboratory analysis of Urine sample

S.N.	Urine sample	Frequency	Percentage
1	Sterile urine sample	160	47.06%
2	Isolated Bacterial Growth	127	37.35%
3	Mixed Bacterial Growth	53	15.6%
Total Urine sample		340	100%

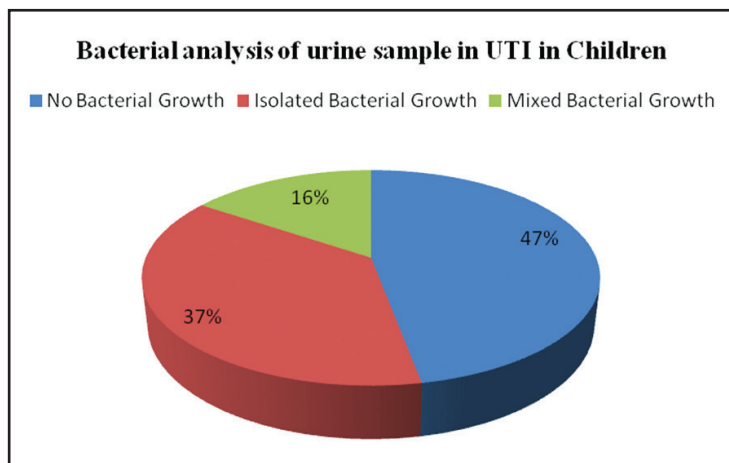
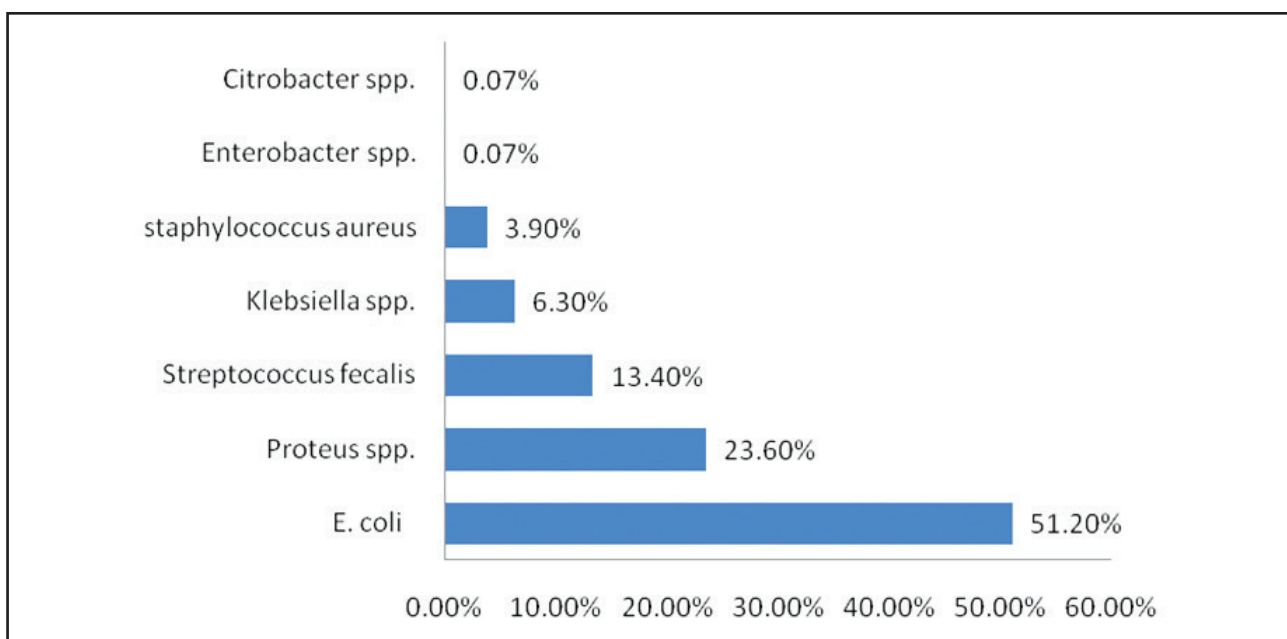


Figure 1: Bacterial analysis of urine sample in UTI in Children

Out of 127 culture positive urine samples, 51.2% showed growth of E. Coli, followed by proteus spp. and Streptococcus fecalis. Other less common bacteria were Klebsiella, staphylococcus and enterobacter spp. (table 2 and figure 2)

Table 3: Growth pattern of bacteria in the culture positive urine samples

S.N.	Class of bacteria	Frequency	Percentage
1	E. coli	65	51.2%
2	Proteus spp.	30	23.6%
3	Streptococcus fecalis	17	13.4%
4	Klebsiella spp.	8	6.3%
5	staphylococcus aureus	5	3.9%
6	Enterobacter spp.	1	0.07%
7	Citrobacter spp.	1	0.07%
Total		127	100

**Figure 2:** Isolated bacterial growth

Of the total 127 patients, more than half 75(59.05%) of the children were male and only 52(40.95%) were female. The sex-wise distribution of the patients is shown in the table 3 and age-wise prevalence of children with UTI is shown in figure 3 and figure 4.

Table 3 and figure 3 showed that 55 (43.31%) of UTI cases were from the age group of 6 to 15 years followed the age group of 1 to 5 years [50 (39.37%)]. Similarly, male children (59.06%) were affected more than the female children (40.94%).

Table 4: Cross-tabulation of age and sex of the children

Age of the children	Sex of the Children		Total (%)
	Male (%)	Female (%)	
3 Month-1 Year	13 (10.24)	9 (7.09)	22 (17.320%)
1-5 Years	28 (22.05)	22 (17.32)	50 (39.37%)
6-15 Years	34 (26.77)	21 (16.53)	55 (43.31%)
Total	75 (59.06%)	52 (40.94%)	127 (100)

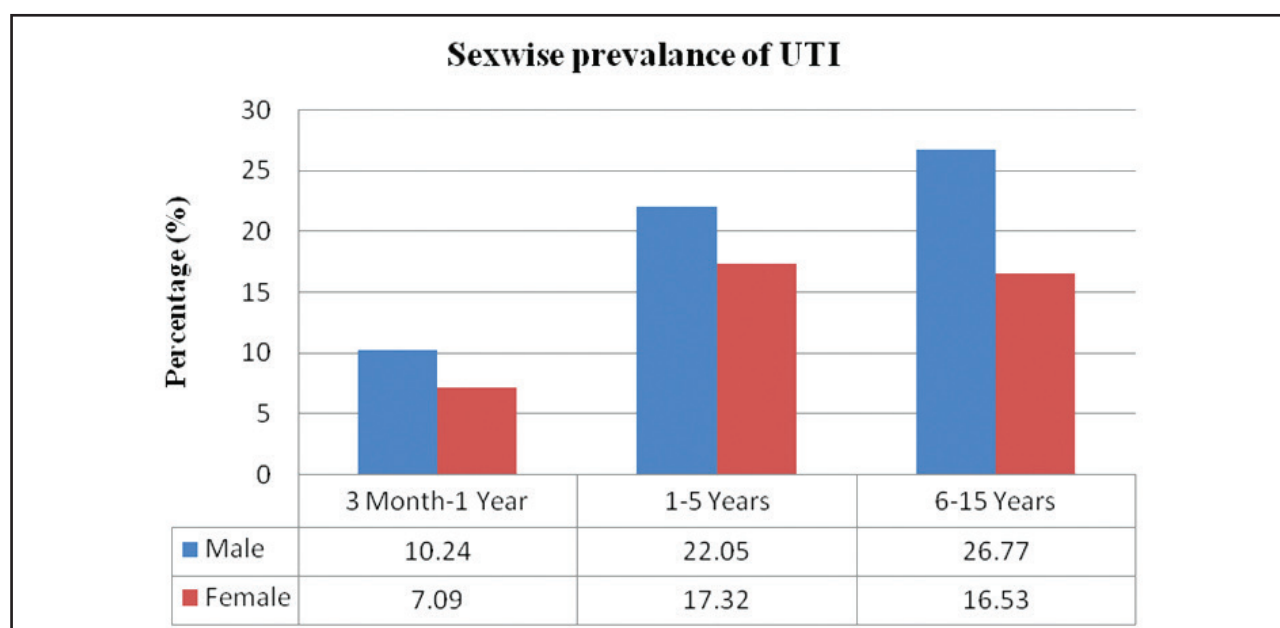
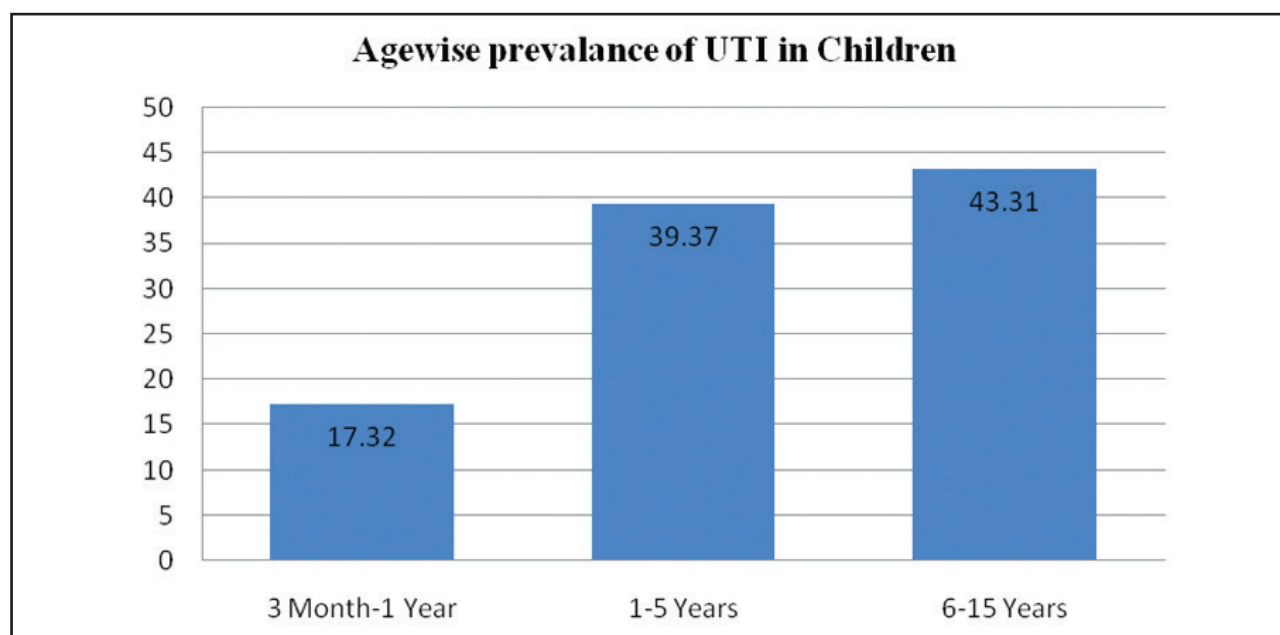
**Figure 3:** Sexwise prevalence of UTI in children**Figure 4:** Agewise prevalence of UTI in children

Figure 4 showed that prevalence of UTI was maximum (43.31%) in the children of 6 to 15 years which was followed by children of age group 1 to 5 years.

ANALYSIS OF PRESENTING SYMPTOMS IN CHILDREN WITH UTI:

Among the culture positive urine samples of the children, almost all of the children were suffered from fever. Apart from fever, 72 (56.7 %) of the children were presented with the symptoms of feeding problems, 68 (53.5 %) were presented with pain abdomen, and 65 (51.2 %) were presented with vomiting. Less typical presenting symptoms of the

children with UTI were screaming attacks/irritability (37.8 %), dysuria (30.0%) and frequency of urination (24.4 %). Similarly, non-specific symptoms like diarrhea, failure to thrive, and convulsion were present in few children and none of the children had enuresis and loin pain. Only few children had history suggestive of UTI in the past and were treated but none had documented UTI. Of all the urine culture positive cases the bacterial isolate was *Escherichia coli* (table 4 and figure 4).

Table 5: Symptoms of the children with UTI

S.N.	Symptoms	Frequency	Percentage
1	Fever	127	100 %
2	Feeding problems	72	56.7 %
3	Pain abdomen	68	53.5 %
4	Vomiting	65	51.2 %
5	Screaming attacks/irritability	48	37.8 %
6	Dysuria,	38	30.0 %
7	Frequency of urine	31	24.4 %
8	Diarrhea,	12	9.4 %
9	Failure to thrive,	8	6.3 %
10	Convulsion	3	2.3 %
11	Enuresis	0	0 %
12	Loin pain	0	0 %

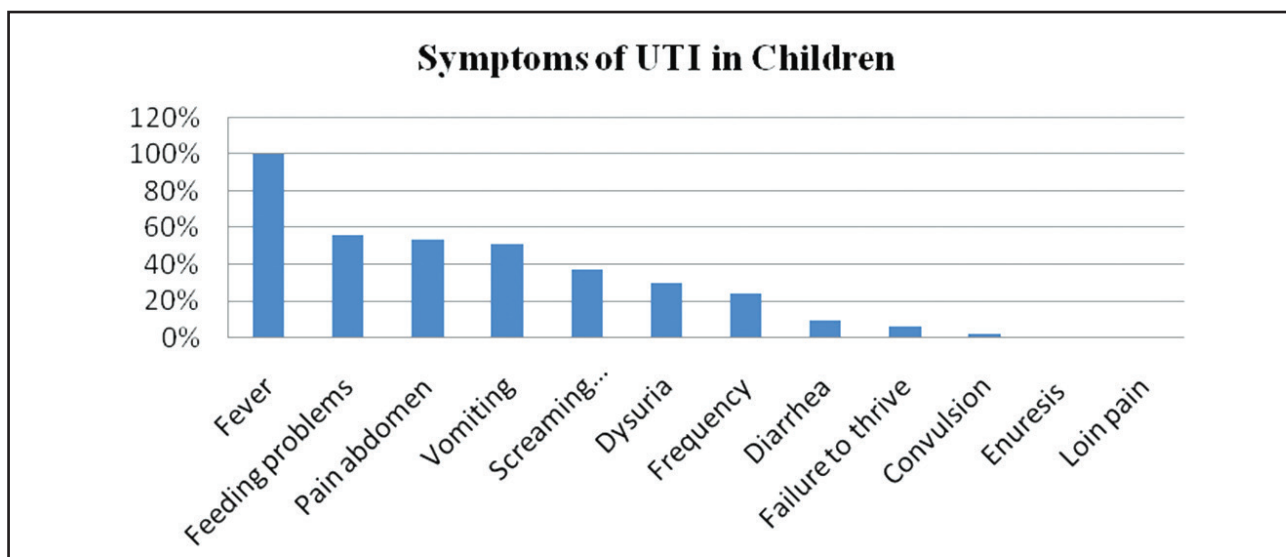


Figure 5: Symptomatology of Children with UTI

DISCUSSION

Out of 340 urine samples collected in our present study, more than one third (37.35%) of the urine samples were culture positive showing isolated

bacterial growth. Interestingly, about half (47.06%) of the urine sample showed no bacterial growth whereas 15.6% of urine samples were showing mixed bacterial growth indicating the contamination during sample

collection. The findings of our study are comparable with the findings of various authors in Nepal. Similar studies conducted in Tribhuvan University, Teaching Hospital found that culture positive cases in UTI were 37.3%^{11, 12}. In contrast with this, Liptak et al found that the prevalence of culture positive UTI cases in the children with neurogenic bladder were found to be slightly more (43%) than normal children with UTI¹³.

Present study found that more than half (51.2%) of the UTI in children were due to *E. coli* and about one fourth (23.6%) of the UTI were due to *Proteus* spp. Moreover, our study found that *Streptococcus fecalis*, *Klebsiella* spp. and *Staphylococcus aureus* were the less common cause and *Enterobacter* spp. and *Citrobacter* spp. were the least common cause of UTI in children. The findings of present study is in accordance with the findings of Rai et al. (47.1%)¹¹, Aiyegoro et al. (52.77%)¹⁷ 33 and Jha B K et al. (51.39%)¹⁴. 30 However, this findings of our study was higher than that of Godwin et al (36.4%)¹⁵, 31 Ranjbar et al. (40%)¹⁶. 32 On the other hand present finding was lesser than the finding of GK et al (93.3%)¹⁸. This great variation in the prevalence of UTI can be due to different laboratory set-up prevailing in the different health facilities of various study areas. *E. Coli* were found to be the most common cause of UTI even in children in the present study, which is similar to that of Regmi et al¹⁹

In our study, we found that UTI were more common in male (59.06%) than in female children (40.94%). Similarly, the prevalence of UTI was maximum in the age group of 6-15 years followed by 1-5 years and less than one year. The findings of our present study are similar to the study done by Gautam et al in Pokhara, Nepal. UTI is found to be the common problem in children and depends upon the age and sex of the children. Various studies^{16,18,19} had already proven that Occurrence of UTI among male children is more than female in first year of life and female after one year of age. Present study showed male children had higher prevalence of UTI among male children as compared to that of female in all age groups. The reason behind this may be due to more preference given to son than daughter in our Nepalese Culture in one hand. In the

other hand it may be due to the fact that majorities of Nepalese male children were un-circumscised which might provide the favorable site for the bacterial colonization inside the prepuce that increases the risk of UTI in male children.

Present study revealed that fever was the main presenting symptoms of all the children with UTI. Besides fever, more than half of the children were presented with the symptoms of feeding problems (56.7 %), pain abdomen (53.5 %), and vomiting (51.2 %). About one third of the children had typical features of UTI like screaming attacks/irritability (37.8 %) and dysuria (30.0%). Only about one fourth of the cases were suffered from frequency of urination (24.4 %). Similarly, non-specific symptoms like diarrhea, failure to thrive, convulsion was present in very few children and none of the children had enuresis and loin pain. Only few children had history suggestive of UTI in the past and were treated but none had documented UTI. Of all the urine culture positive cases the bacterial isolate was *Escherichia coli*. This observation is in consistent with studies done by Bachur and Harper³ (7%) and Boreland and Stoker⁹ (10%). Present study found that the most common organism causing UTI in children was found *Escherichia coli*, which is in accordance with almost all other reports^{17,19,20}.

CONCLUSION

Prevalence of UTI were more in male than in female children and *E. coli* was found to be the most common bacteria causing it. Besides fever, feeding problems, pain abdomen, and vomiting were the major presenting symptoms of morbidity in children with UTI. Although UTI is rarely a difficult problem, attention should be paid during the diagnosis and management of it

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Conflicts of interest:

We declare no conflict of interest among the author for this article.

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