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Research Article

INCIDENCE AND CONTRIBUTING FACTORS OF URINARY TRACT INFECTION IN CHILDREN UNDER 6 YEARS

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ABSTRACT

Urinary Tract Infection (UTI) is common health problem in children, various contributing factors rise the incidence of UTI. The objective of this study is to find out the incidence and contributing factors of UTI in children between 1 month to 6 years. The incidence of UTI in children who visited the Pediatric department is 3.2%. Out of 508 suspected case of UTI, 36.6% were diagnosed UTI positive. Regarding UTI positive cases, 47% had urine culture test positive result by isolating the bacterial species. Concerning the urine culture positive, 92% shows isolation of *E. Coli* and 5.8% shows *Klebsiella* species. There is correlation between mothers education status (p-value <0.001), occupation (p-value <0.001), children age (p-value 0.048), and ethnicity (p-value <0.001) with the occurrence of UTI. In this study, not cleaning genital organ after urination (71.5%), the inappropriate way of cleaning genital organ after defecation (67.2%) and not changing diaper after each urination (100%), respectively were identified as a major contributing factors for UTI in children. Therefore, knowledge of mothers in regard to children health and hygiene and proper practice play effective role to prevent UTI in children.

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INTRODUCTION

UTI is the second most common bacterial disease which accounts for more than eight million per year. Globally, childhood UTI account for 0.7% of physician office visits and 5–14% of emergency department visits by children annually (Steven & Linda, 2006 and Shaikh, Morone, Bost, & Farrell, 2008). UTI should be suspected in an infant or child presenting with unexplained fever beyond three days. The clinically correlated with UTI and urine samples showing equal or more than 5 pus cells/hpf, were treated as UTI positive (Pead and Maskell, 1994). However, the final confirmation of the diagnosis of UTI can be made by urine culture and sensitivity. UTI result from ascending infection by single gram negative bacteria such as *Escherichia coli*, *Klebsiella*, *Proteus*, *Enterobacter*, or *Pseudomonas*. (Lewis, Heitkemper, & Dirksen, 2004 & Ghedira, Messaoudi, Ben, & Guediche, 2004). If not treated promptly and appropriately, pediatric UTI may lead to significant acute morbidity and irreversible renal damage.

Children, however, have a wide variety of clinical presentation, ranging from the asymptomatic presence of bacteria in the urine to potentially life-threatening infection of the kidney. As many children are affected with UTI in all part of the world and especially in developing countries, family status, hygiene and sanitation, socio-economical condition etc influences the incidence of UTI in children. There is need for further investigation in order to provide proper care and to make the people aware of contributing factors to UTI. Mother's education, information and practice plays an important role in the prevention of UTI in children. Therefore, in this study, contributing factors of UTI among children below 6 years of age was studied.

MATERIALS AND METHODS

A descriptive, cross sectional study was conducted at Fishtail Hospital and Research Centre (FHRC), Pokhara. All the children from 1 month to 6 years attending hospital and confirmed as UTI during the period of 6 months were selected for sample. Urine specimen was collected, routine urine analysis and urine culture with sensitivity pattern were

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performed following standard protocol. Semi structure interview schedule was used with mother to collect data. Ethical clearance was taken from Chitwan Medical College-Institutional Research Committee and informed consent was obtained from each respondent prior to data collection. Data was analysed by descriptive and inferential statistics (chi-square test) using SPSS version 20. The *P* value of less than 0.05 is considered statistically significant.

RESULT AND DISCUSSION

In this study, out of 5,820 children who visited to the hospital, only 508 (8.7%) were suspected for UTI after examination by consultant pediatrician. After examination of clinical symptoms and urine routine examination, 186 (3.2%) out of 5,820 visited to the hospital, were confirmed UTI and treated. The UTI positive is 186 (36.6%) among the 508 suspected UTI. The incidence of UTI in the present study is 3.2% out of total children visited at the department of pediatrics, FHRC, Pokhara. The incidence of UTI is 186 (36.6%) when compared with the case of 508 suspected UTI (Table 1). This study was supported by the finding of the study conducted by Malla et al., (2007). In children, they showed 39.5% UTI positive. Routine examination of urine was tested for all the UTI suspected cases and found that most of the cases urine samples were yellow in color and clear in appearance (72.0%). However 28% urine samples were turbid in appearance. We also noted that 23.6% urine sample gave protein positive results (Table 2) and 186 urine samples demonstrate equal or more than 5 pus cells/hpf. Those samples which consist of equal or more than 5 pus cells/hpf were mostly looked turbid and have proteins positive results. The clinically correlated with UTI and urine samples showing equal or more than 5 pus cells/hpf, were treated as UTI positive. Similarly, Pead and Maskell, (1994) performed urine routine test and evaluated with the occurrence of UTI in children.

Table 3 shows 47% urine culture test gave positive culture result by isolating the bacterial species, which was supported by the study conducted by Gautam & Pokhrel, (2012) which revealed that isolated bacteria in urine culture was 53.43%. Regarding the bacteria present in urine, out of 87 samples, 92% of the samples were E.Coli. This finding is also supported by the finding of the study conducted by Paschke et al., (2010) in USA, they found that the causative organism was E.coli in 80%. The consistent result of isolating predominantly E.Coli organism in culture test is also supported by Ghedira et al., (2004). Similarly, in our study we predominantly isolated E.Coli in 92% cases (80 isolated out of 87 cases) followed by 5.8% of Klebsiella species.

Regarding the personal hygiene to contribute the UTI in children, the way of cleaning genital organ, diaper changing habit, frequency of washing and changing underwear and bathroom habits were found not hygienically maintained (Table 4 & 5). Likewise, National Collaborating Centre for Woman's and Children's health, UK (2007) concluded that poor hygiene or bathroom habits contribute to cause UTI in children. The knowledge, education and practice of family members have an impact on personal hygiene maintenance.

Regarding the contributing factors of UTI in children, study result shows 72.58% were not taking enough fluid, 31.7% had a constipation and 62.4% with incomplete voiding urine (data not shown). This result was supported by the study conducted by National Collaborating Centre for Woman's and Children's health, UK (2007) where 43% had low fluid intake, 21% had constipation and 45% had infrequent voiding. Table 6 indicates that out of 186 respondents, 76.3% had no local inflammation in genital organ and 23.7% had local inflammation in genital organ. Among them 79.5% had eczema and 11.4% had napkin or underwear rashes. Out of 186 respondents, 95.2% had no congenital anomalies of genital organ and 4.8% had congenital anomalies. Among them 100 % had phymosis as congenital anomalies. Out of 186 respondents, 60.8% had no ever admitted in hospital. Regarding history of indwelling catheter insertion 97.3% had not inserted catheter and 2.7% had only inserted catheter. Zajackowski M et al., (2001) revealed that anatomic abnormalities of the urinary tract predispose children to UTI because of inadequate clearance of uropathogens. Anatomical abnormalities cause functional abnormalities. Infections associated with urinary tract malformation serve as a reservoir for bacterial persistence and result in recurrent UTI. This is supported by the study conducted by Gottlieb S et al., (1980), evaluating the frequency and type of genital inflammation and consequence of UTI in 35 girls infected with *Enterobius vermicularis*.

The distributions of children sex are almost equal in this present study, where males were 50.8% and females were 49.2%. Table 7 shows significant correlation between children's age, ethnicity and clinical problem with the occurrence of UTI. However there was no significantly difference between the sex of children and occurrence of UTI. Contradictory to our results, boys are more susceptible before the age of three months; there after the incidence is substantially higher in girls. Data on the true incidence of UTI are limited. It has been estimated that 7-8 % of girls and 2 % of boys will be referred with UTI by the age of eight years of life (Montini et al., 2011). We postulate that the tendency of caring male children is high in Nepali society due to lack of education and knowledge, so many female children even suffering from UTI, may not be presented in this study. Therefore, the case of male and female are almost same in number.

Table 8 shows the demographic characteristics and knowledge of the mothers. Most of them (78.0%) were in the age of in between 20-29. Regarding occupation of mother 49.8% of them were house wife. More than half of the respondents were from urban region 55.7%. Likewise, a study conducted to assess the parental knowledge on UTI by Owen, et al., (2003). A semi-structured questionnaire was given to parents at first attendance (quantitative data) and content analysis of qualitative data was carried out. 52 out of 84 parents responded (response rate 64%), 45 (86.5%) felt that they had been given a full explanation of the significance of UTI in childhood. There was statistically significant association between the mother's literacy, education status and occupation with the occurrence of UTI in children (Table 8). However, there were no significant different in UTI case among rural and urban resident, which is in contrast with the report published by Kwok, et al., (2006). They found that the incidence rate of UTI in small cities and

rural areas was two times higher as compared to larger cities, concluding incidence of UTI is related to gender, season and urbanization. In the present study, we believe that the mother's education, hygiene and sanitation, socio-economical status, knowledge and practice contribute on children's health not the place where she lives.

Table 1 Incidence of UTI

Children attending in Hospital	Frequency	Percent
UTI suspected	508	8.7
Confirmed UTI	186	3.2

n = 5,820

Table 1 indicates that out of 5,820 children attending in hospital, 508 (8.7%) were suspected UTI. Out of 5,820 respondents 186 (3.2%) of the children were confirmed with UTI and 96.8% were non UTI.

Table 2 Routine Urine Report

Variable	Frequency	Percent
Physical appearance (color)		
Dark yellow	89	17.5
Light yellow	60	11.8
Yellow	359	70.7
Physical appearance (transparency)		
Clear	366	72.0
Turbid	142	28.0
Chemical examination (protein)		
Nil	388	76.4
Present	120	23.6
Microscopic examinations (pus cells/hpf)		
0-1	115	22.6
2-3	197	38.8
4-5	10	2.0
>=5	186	36.6

n = 508

Table 2 shows that out of 508 respondents 70.7% of the children had yellow physical appearance and 11.8% had light yellow appearance. Regarding physical appearance (transparency), 72% of the children had clear appearance and 28% had turbid appearance. Regarding chemical examination (protein), 76.4% of the children had nil and only 23.6% had protein present.

Table 3 Result of Urine Culture in UTI cases

Variable	Frequency	Percent
UTI present (n=186)		
Culture positive	87	47
Culture negative	99	53
Culture positive (n=87)		
E. Coli	80	92.0
Klebsiella pneumonia	5	5.8
Proteus mirabilis	1	1.1
Pseudomonas Aeurogenosa	1	1.1

Table 3 indicates out of 186 respondents, 47% shows significant growth of organism in urine and 54% shows no isolation of bacterial organisms. Among 87 respondents, 92% had isolated E. coli followed by 5.8% of klebsiella and 1.1% of each category had proteus mirabilis and pseudomonas aeurogenosa.

Table 4 shows that out of 186 respondents, 71.5% had not cleaned their children genital organ after urination and 28.5% had cleaned their children genital organ after urination.

Table 4 Contributing Factors of UTI in Children Response by Mothers: Cleaning of Genital Organ

Variable	Frequency	Percent
Cleaning children genital organ after urination (n=186)		
Yes	53	28.5
No	133	71.5
If yes, way of cleaning genital organ (n=53)		
From front to back	1	1.9
From inner to outer	2	3.8
From outer to inner	4	7.5
Only outer surface	46	86.8
Cleaning children genital organ after defecation		
Yes	186	100
No	-	-
If yes, way of cleaning genital organ (n=186)		
From front to back	1	0.5
From back to front	125	67.2
From inner to outer	18	9.7
From outer to inner	42	22.6
Material used to clean genital organ ** (n=186)		
With water	155	83.3
With wet napkin	20	10.8
With dry towel	85	45.7
With toilet paper	27	14.5

** Multiple Response

Table 5 Contributing Factors of UTI in Children Response by Mothers: Using and cleaning Diaper or Napkins

Variable	Frequency	Percent
Wearing diaper/Napkins (n=186)		
Yes	83	44.6
No	103	55.4
If yes, change diaper after each urination		
Yes	-	-
No	83	100
If no, reason of not changing diaper**		
Lack of knowledge	75	90.3
Lack of money	16	19.2
Negligence	65	78.3
Not available	35	42.1

**Multiple Response

Table 5 reveals that out of 186 respondents, 44.6% were wearing diaper or napkin and 55.4% were not wearing diaper or napkin.

Table 6 Local Inflammation, Congenital Anomalies of Genital Organ, hospital stay and Catheterization

Variable	Frequency	Percent
Child having local inflammation in genital organ		
Yes	44	23.7
No	142	76.3
If yes, type of inflammation** (n=44)		
Eczema	35	79.5
Diaper rashes	16	36.4
Napkin rashes	14	31.8
Underwear rashes	5	11.4
Child having congenital anomalies of genital organ		
Yes	9	4.8
No	177	95.2
If yes, type of congenital anomalies** (n=9)		
Phymosis	9	100
Admitted in Hospital (n=186)		
Yes	73	39.2
No	113	60.8
History of indwelling catheter insertion(n=186)		
Yes	5	2.7
No	181	97.3

** Multiple Response

Among 83 respondents, 100% had not changed diaper or napkin after each urination. Among 83 respondents, 90.3% were not changing diaper or napkin due to lack of knowledge and 19.2% due to lack of money.

Table 6 shows that out of 186 respondents, 76.3% had no local inflammation in genital organ and 23.7% had local inflammation in genital organ. Among them 79.5% had eczema and 11.4% had napkin or underwear rashes.

Table 7 Association between Children Socio-demographic Characteristics and UTI

Variable	UTI suspected in child		P-value
	Present n=186(%)	Not present n=322(%)	
Age in month			
< 12	22 (53.7)	19 (46.3)	
12 – 35	60 (31.1)	133 (68.9)	<0.048
36 – 59	60 (37.5)	100 (62.5)	
>59	44 (38.6)	70 (61.4)	
Sex			
Male	97 (37.6)	161 (62.4)	0.640
Female	89 (35.6)	161 (64.4)	
Ethnicity			
Brahmin/Chhetri	74 (35.9)	132 (64.1)	<0.001
Newar	23 (28.4)	58 (71.6)	
Gurung/magar/Rai	50 (38.2)	81 (61.8)	
Dalit	17 (28.3)	43 (71.7)	
Muslim	22(73.3)	8(26.7)	
Suffering from clinical problem			
< 3	16 (18.6)	70 (81.4)	<0.001
3 – 5	104 (32.2)	219 (67.8)	
>5	66 (66.7)	33 (33.3)	

n=508

Level of significance is ≤ 0.05 χ^2 is computed for p-value

Table 8 Association between Mother's Socio-demographic Characteristics and UTI in children

Variable	UTI in children		P-value
	UTI Present n=186 (%)	Not present n=322(%)	
Age group in years			
< 20	23 (37.1)	39 (62.9)	0.972
20 – 29	135 (36.8)	232 (63.2)	
≥ 30	28 (35.4)	51 (64.6)	
Literacy status			
Literate	160 (33.5)	317 (66.5)	<0.001
Illiterate	26 (83.9)	5 (16.1)	
Education level			
General literate	75 (68.2)	35 (31.8)	<0.001
Basic education	30 (50.0)	30 (50.0)	
Secondary education	15 (15.6)	81 (84.4)	
Higher secondary education	23 (20.2)	91 (79.8)	
Bachelor and above	17 (17.5)	80 (82.5)	
Occupation			
Farmer	36 (69.2)	16 (30.8)	<0.001
House wife	81 (32.0)	172 (68.0)	
Labor	15 (55.6)	12 (44.4)	
Service/Health worker	36 (34.6)	68 (65.4)	
Business	18 (25.0)	54 (75.0)	
Place of residence			
Rural	75 (33.3)	150 (66.7)	0.171
Urban	111 (39.2)	172 (60.8)	
Type of family			
Nuclear	72 (32.9)	147 (67.1)	0.128
Joint	114 (39.4)	175 (60.6)	

n = 508

Out of 186 respondents, 95.2% had no congenital anomalies of genital organ and 4.8% had congenital anomalies. Among them 100 % had phimosis as congenital anomalies. Out of 186 respondents, 60.8% had no ever admitted in hospital. Regarding history of indwelling catheter insertion 97.3% had not inserted catheter and 2.7% had only inserted catheter.

Table 7 shows that there is significant relationship of UTI and child ethnicity ($p < 0.001$), and child suffering from problem ($p < 0.001$). There is no significant relationship between child sex and presence of UTI.

Table 8 shows that there is significant relationship between UTI with mother educational status ($p < 0.001$), educational level ($p < 0.001$) and mother occupation ($p < 0.001$). There is no statistically significant between UTI suspected with age group of mother, place of residence and type of family.

CONCLUSION

This study reveals that the knowledge and practice of the mother regarding the contributing factors of urinary tract infection will help to reduce the prevalence and early diagnosis, treatment aims to prevent destruction and scarring of renal parenchyma. It is very important to detect a urinary tract infection in a child of any age, because of the chance, that it may cause permanent kidney damage.

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