

A Study on the Clinical, Microbiological, Etiological Characteristics of Urinary Tract Infections and Urinary Tract Anomalies in Children of Age Group 0-14 Years In A Tertiary Care Hospital

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Received: 25-12-2023 / Revised: 23-01-2024 / Accepted: 26-02-2024

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Conflict of interest: Nil

Abstract:

Introduction: Fever is the main reason children attend the paediatric emergency room. When young infants have feverish infections, it can be challenging to determine the underlying reason. A general viral infection is often considered the cause of feverish sickness in the absence of specific focused symptoms. UTIs are a common cause of fever without concentration, especially in children under two years old. Pathogen invasion of the urinary system is the cause of a urinary tract infection (UTI). The upper or lower tract may be affected by an infection, depending on whether it is in the kidney, bladder, or urethra. A child's typical urinary architecture and physiology, which includes complete emptying at regular, adequate intervals and unidirectional urinary tract flow, should protect them from urinary tract infections.

Material and Method: The paediatric department of SCBMCH & SVPPGIP, Cuttack, conducted the current study from December 2015 to November 2017, a span of 24 months. Research design: hospital-based prospective case control study. Selection of Patients: both outside and within medical facilities The investigation examined children with urinary tract infections (UTIs) between the ages of 0 and 14 who were treated by the paediatric department at SCBMCH & SVPPGIP, Cuttack over a 24-month period ending in November 2017. To choose the cases for the research, a purposive sampling strategy was used. Children who have symptoms of UTI and positive urine culture (UTI) are considered cases. Age-matched kids who were selected from a group at a follow-up appointment for a previous febrile treatment serve as the comparison and control groups.

Result: The study included 270 children in all who met the inclusion criteria. Out of the total of 270 youngsters, 135 had a positive urine culture (case), whereas the remaining 135 had a negative urine culture type (control). Data were gathered using a pre-made proforma. A systematic questionnaire was used to interview parents and children about urinary tract infections. The following information was recorded: prior history of UTI, worm infestation, bowel habits, circumcision and phimosis in male children, age, sex, anthropometry (weight and height), socioeconomic position, and other predisposing risk factors.

Conclusion: Urinary tract infections are frequent in children and can result in long-term morbidity. The following findings are the result of the investigation: UTIs are more common in infants. It is more common for females than for males to have a UTI. The afflicted children's MALE: FEMALE ratio was 1.27 for older children and 1.1:1 for infants. Most children with UTIs fall within Classes V and IV of the Kuppaswamy Socioeconomic Scale. Fever was the predominant indicator of a UTI. There were also other nonspecific symptoms noted, such as burning micturition, low appetite, vomiting, discomfort in the abdomen, worm infestation, and rising frequency was shown to be closely related to UTI, with worm infestations present in 25% of the children in the UTI group.

Keywords: UTI-Urinary tract infection, USG- Ultra sonography, VUR-vesicoureteral reflux, Paediatrics, E. coli, Fever

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Introduction

The most frequent cause of visit to the paediatric emergency room is fever. [1,2] It can be difficult to identify the cause of feverish illnesses in young children. When there are no particular focal symptoms of infection, general viral infection is frequently blamed for febrile illness [3]. Fever without focus is commonly caused by UTIs, particularly in children under the age of two. [4,5] A urinary tract infection (UTI) is the result of pathogen invasion of the urinary system. Depending on the infection in the kidney, bladder, or urethra, the infection may affect either the upper or lower tract.

Normal urinary anatomy and physiology, which includes unidirectional urinary tract flow and full emptying at regular, appropriate intervals helps in prevention from UTI. Since very young children sometimes have nonspecific indicators and unclear symptoms, it is possible that they go undiagnosed, making it difficult to obtain reliable data on incidence and prevalence. Male to female ratio of 5:1 and the incidence of UTI is 1% in term neonates and 3% in preterm neonates. For boys, the probability of developing a urinary tract infection before the age of 14 is between 1-3%, while for girls, it is 3-8%. [6,7,8] While no febrile urinary tract infection primarily affects girls older than three years of age, febrile urinary tract infections are more common in the first year of life in both sexes. [13]

Young children and infants are more vulnerable to the effects of UTI since they may not exhibit many symptoms other than fever and are more likely to suffer renal impairment than older children. In addition, compared to older children, this age group has a higher incidence and severity of vesicoureteral reflux (VUR), with the most severe type only occurring in infants. [4]

Because there is a chance to prevent renal damage, infants and young children with UTIs should receive extra care. First, a child with severe VUR or obstructive abnormalities may present as UTI. Second, the identification and treatment of these children's UTIs may be delayed; they may exhibit a feverish illness without any localising symptoms. Third, the initial bout of urinary tract infection in infancy or early childhood typically marks the start of an ongoing process with the possibility of recurrences rather than a single episode. As the number of recurrences rises, so does the chance of renal impairment. Particularly in young children, even one diagnosed UTI should be treated seriously because of the possibility of renal parenchymal injury [6], which can result in decreased renal function and hypertension [9]. UTI make up a frequent source of morbidity that, when combined with urinary tract abnormalities, can lead to long-term consequences such hypertension and chronic renal failure. [10] It is therefore essential to

properly diagnose and treat UTIs in children as soon as possible.

The causes of UTIs are not completely understood, however several risk factors are. Renal tract anomalies such as neurogenic bladder and vesicoureteric reflux have been found to be the highest risk factors. Other established risk factors include female gender, young age, and an uncircumcised status in boys. [14-17] UTI screening is time-consuming for staff, painful for patients, and costly overall. Since urinary tract anomalies might be indicated by UTIs, it is crucial to diagnose UTIs in young children. It is advised to have imaging examinations to find congenital or acquired anomalies after first UTI in every child under 6 years.

Materials and Methods

The current study was carried out over a 24-month period, from December 2015 to November 2017, at the pediatric department of SCBMCH & SVPPGIP, Cuttack. Study design: Prospective case control study conducted in a hospital. Selection of Patients: both outdoor and hospitalized children aged 0-14 years. The study analysed children with UTIs aged 0-14 years who received care from the Department of Paediatrics at SCBMCH & SVPPGIP, Cuttack. The study employed purposive sampling approach to choose the cases. Cases are defined as children exhibiting signs and symptoms of a UTI with a positive urine culture (UTI). The comparison and control groups are made up of age-matched children who were drawn from a group at a follow-up visit for a prior febrile illness (non-UTI).

Inclusion Criteria:

1. Children ages 0 to 14 years old.
2. Febrile (101°F children with clinical signs and symptoms of UTI and have a positive urine culture).

Exclusion Criteria:

1. The child's guardians or parents refuse to enroll them in the research.
2. Profound pyuria accompanied by a negative urine culture.
3. Positive Urine culture but, suspecting contamination.
 - i. Growth of two or more pathogens in combination.
 - ii. Development of organisms (lactobacilli in healthy females) that typically make up the periurethral flora.
4. Unable to provide a sample of urine and
5. Having another cause of fever, such as a viral respiratory tract infection, or another reason for discomfort in the abdomen, such as gastroenteritis or acute appendicitis.
6. UTI acquired in the hospital as a result of urinary catheter use.

Result

The observations are illustrated below by following tables and graphs

Table 1: Age And Gender Distribution Of 270 Patients Suspected Of UTI

| | Male | Female | Total N=270 |
|------------|-----------|------------|-------------|
| 0-1 Year | 69(55.2%) | 54(37.24%) | 123(45.55%) |
| 1-5 Years | 31(24.8%) | 45(31.03%) | 76(28.14%) |
| 5-14 Years | 25(20%) | 46(31.72%) | 71(26.3%) |
| Total | 125(100%) | 145(100%) | 270(100%) |

Table 2: Distribution of UTI Patients Based On Age And Gender

| Age | Urine Culture Positive | | Total N=135 |
|------------|------------------------|------------|-------------|
| | Male | Female | |
| 0-1 YEAR | 33(60%) | 30(37.5%) | 63(46.6%) |
| 1-5 YEARS | 12(21.8%) | 25(31.25%) | 37(27.4%) |
| 5-14 YEARS | 10(18.2%) | 25(31.25%) | 35(26%) |
| TOTAL | 55(100%) | 80(100%) | 135(100%) |

UTI was confirmed in 135 children. 74% of them were below 5 years of age and 26% were older children. 59% of the affected were girls and remaining 41% were boys. The MALE: FEMALE ratio of the affected children was 1.1:1 in infancy and 1:2.27 among older children.

Table 3: Distribution of UTI Patients Based On Their Socioeconomic Status

| Socioeconomic Status | Gender | | Total N=135 |
|----------------------|------------|------------|-------------|
| | Male | Female | |
| Class I | 5(9.09%) | 3(3.75%) | 8(5.92%) |
| Class II | 12(21.81%) | 12(15%) | 24(17.77%) |
| Class III | 9(16.36%) | 16(20%) | 25(18.51%) |
| Class IV | 11(20%) | 18(22.5%) | 29(21.48%) |
| Class V | 18(32.72%) | 31(38.75%) | 49(36.29%) |
| Total | 55(100%) | 80(100%) | 135(100%) |

Majority of children with UTI belong to Class V 36.29% and Class IV 21.48% according to Kuppaswamy Socio economic Scale.

Table 4: Frequency of Different Pathogens Isolated From Urine in Children with UTI

| Pathogens | Gender | | Total N=135 |
|---------------|-----------|------------|-------------|
| | Male | Female | |
| E. Coli | 31(56.3%) | 49(61.25%) | 80(59.25%) |
| Enterococcus | 7(12.72%) | 16(20%) | 23(17.03%) |
| Staph Aureus | 6(10.9%) | 7(8.75%) | 13(9.62%) |
| Klebsiella | 2(3.63%) | 3(3.75%) | 5(3.70%) |
| Acinetobacter | 2(3.63%) | 2(2.5%) | 4(2.96%) |
| Pseudomonas | 3(5.45%) | 1(1.25%) | 4(2.96%) |
| Enterobacter | 1(1.81%) | 2(2.5%) | 3(2.22%) |
| Proteus | 2(3.63%) | 0(0%) | 2(1.48%) |
| Candida | 1(1.81%) | 0(0%) | 1(0.74%) |
| Total | 55(100%) | 80(100%) | 135(100%) |

Table 5: Frequency of Symptoms in Patients with UTI

| Symptoms | Numbers Of Patients |
|------------------|---------------------|
| Fever | 96 (71.1%) |
| Vomiting | 53 (39.2%) |
| Pain abdomen | 31 (22.9%) |
| Worm infestation | 27 (20%) |
| Dysuria | 23 (17.03%) |
| Poor feeding | 23 (17.03%) |

| | |
|---------------------|-----------|
| Increased frequency | 11 (8.1%) |
| Headache | 9 (6.7%) |
| Hematuria | 8 (5.9%) |
| Dribbling | 6 (4.4%) |
| Urgency | 6 (4.4%) |
| Poor stream | 5 (3.7%) |
| Constipation | 5 (3.7%) |
| Supra pubic mass | 2 (1.48%) |
| Malodor urine | 1 (0.74%) |

Table 6: Distribution of Ultrasonogram Findings in Patients, With UTI And Non-UTI

| Ultrasound Finding | UTI | Non-UTI | Total N=270 |
|--------------------|------------|-------------|-------------|
| Normal | 94(69.63%) | 129(95.56%) | 270 (100%) |
| Abnormal | 41(30.37%) | 6(4.44%) | |
| Total | 135(100%) | 135(100%) | |

USG was performed in all 270 children. From 135 confirmed case of UTI, 94(69.63%) children were found to be normal. 41 (30.37%) children had abnormal USG. From 135 non-UTI cases, 6 (4.44%) had abnormal USG finding and 129 had normal USG.

Table 7: Frequency of Ultrasound Findings in UTI and Non-UTI Group

| Ultrasound Findings | UTI | Non-UTI |
|----------------------------------|------------|-----------|
| Increased Bladder Wall Thickness | 12(29.26%) | 0(0%) |
| U/L Or B/L Hydronephrosis | 9(21.95%) | 2(33.34%) |
| U/L Or B/L Hydroureteronephrosis | 8(19.51%) | 1(16.67%) |
| Horseshoe Kidney | 3(7.31%) | 1(16.67%) |
| Increased Echogenicity | 3(7.31%) | 1(16.67%) |
| CKD | 2(4.87%) | 1(16.67%) |
| Pelvic Kidney | 1(2.43%) | 0(0%) |
| Infected Urachal Remnant | 1(2.43%) | 0(0%) |
| Polypoidal Lesion | 1(2.43%) | 0(0%) |
| Echogenic Debris | 1(2.43%) | 0(0%) |
| Total | 41(100%) | 6(100%) |

From 41 abnormal USG, 12(29.26%) had increased bladder wall thickness, 9(21.95%) had U/L or B/L Hydronephrosis, 8(19.51%) had U /L or B/L Hydroureteronephrosis, Horseshoe in 3(7.31%) and increased echogenicity found in 3(7.31 %). CKD confirmed in 2(4.87%) children. Infected urachal remnant, Polypoidal lesion, Echogenic debris were also found in UTI group. In Non-UTI group Hydronephrosis was found in 2(33.34%).

Discussion

The research involved 270 children in total; of them, 125 (46.29%) were boys and 145 (53.70%) were girls. Among those aged 0–1, 123 (45.55%), 1–5 years, 76 (28.14%), and 5–14 years, 71 (26.29%) were included. The research involved 270 children in total; of them, 125 (46.29%) were boys and 145 (53.70%) were girls. There were 123 (45.55%) babies in the 0–1 age group, 76 (28.14%) children in the 1–5 year age group, and 71 (26.29%) children in the 5–14 year age group. In 135 youngsters, UTIs were verified. Of them, 26% were older kids and 74% were younger than five years old. Of those afflicted, 41% were males and 59% were girls. The afflicted children's MALE:

FEMALE ratio was 1.1:1 during infancy and 1: 2.27 for older children. (Table -1)

Table 2 shows that of the 135 UTIs with a positive urine culture, 80 (59.25%) were female and 55 (40%) were male. The afflicted children's M:F ratio was 1.27 for older children and 1.1 for babies. According to this study, UTI is more common with female gender. The outcomes align with previous research findings. According to research by Shawn K. N. et al. (1998) [23], there is a strong (P-<0.001) correlation between female gender and UTI. In their study, Naseri M et al. (2007) [24], Suresh Kumar P et al. (2009) [25] found that the proportion of girls afflicted with UTIs was substantially greater (P=0.002), (P- <0.001) respectively.

According to Kuppaswamy socio economic scale, this survey revealed that 49(36.29%) of the participants belonged to class V, 29(21.48%) to class IV, 25(18.51%) to class III, 24(17.77%) to class II, and 8(5.92%) to class I. In our study, children from lower socioeconomic backgrounds (grade V) had a greater percentage of UTIs. This incidence could be the result of linked malnutrition,

inadequate toilet training, and poor hygiene, all of which are common in this demographic. (Table -3)

In our study, the most common organism that was causing UTI is E. coli. Byran CS et al. (1998) [19] reported that E. Coli accounted for 85% of urine pathogens. According to Bagga A et al. (2000) [10], E. coli caused 70% of recurrent infections and 90% of first symptomatic UTIs. In their investigation, Chon CH et al. (2001) [18] discovered that the most often identified urine pathogen was enteric gram-negative bacteria, namely E. Coli. According to research by Zamir et al. (2004) [20], the primary pathogens causing UTIs were E. Col. (85%) and Klebsiella sp. (5.1%). E. Coli (80%) and Klebsiella sp. (9%), according to Zorc JJ et al. (2004) [21], were the most common pathogens found in children with UTIs. According to Jacobsen SM et al. (2008) [22], the most often isolated uropathogenic E. coli strains.

Other than fever, no consistent symptoms were shared by all UTI patients. More non-specific symptoms were also seen, including vomiting (39.2%), pain abdomen (22.9%), worm infestation (20%), burning micturition (17.03%), poor feeding (17.03%) and increase frequency (8.1%). The most typical symptom was fever (71.1%). (Table 5). Fever is the most typical sign of a UTI in babies, according to earlier research by Winberg J et al (1974) [26] and Grinsburg CM et al (1982) [27]. Characteristics including irritability (55%) and poor eating (38%), vomiting (36%), diarrhoea (31%), and abdominal distension (8%) were the symptoms mentioned by Ginsburg et al. (1982)[27]. Among 20 babies with UTI, Hoberman et al. (1993) [28] found diarrhoea, vomiting, poor feeding, and irritability in 30%, 40%, 65%, and 80% of the cases, respectively.

All 270 children in our research had USG done on them. Of the 135 children with confirmed UTI cases, 94 (69.63%) were normal and rest 41 (30.37%) had abnormal USG. 6(4.44%) of the 135 non-UTI patients showed aberrant USG findings, while 129 had normal USG findings. 12 (29.56%) of the 41 abnormal USG scans showed thickened bladder walls, 9 (21.95%) showed U/L or B/L hydronephrosis, and 8 (19.51%) showed U/L or B/L hydroureteronephrosis. 3 cases (7.31%) had horseshoes, and 3 cases (7.31%) had higher echogenicity. In 2 children (4.87%) CKD diagnosed. Infected urachal remnant, Echogenic debris and polypoidal lesions were also discovered in the UTI group. Hydroureteronephrosis was discovered in 2 (33.34%) of the non-UTI group.

Conclusion

Urinary tract infection, though a common paediatric issue but has the potential to cause long-term morbidity. The investigation leads to the following conclusions: Infants and girls have a

higher chance of being affected by UTIs. The affected children's MALE: FEMALE ratio was 1.1:1 during infancy and 1: 2.27 for older children. Lower socioeconomic status has a crucial role in children being affected with UTI (Kuppu-swamy-Classes IV and V). The most common sign of a UTI was fever. Additional nonspecific symptoms were also observed, including burning micturition, poor eating, vomiting, abdominal pain, worm infestation, and increasing frequency. A quarter of the youngsters in the UTI group had worm infestations. was discovered to be substantially linked to UTI. The most common pathogen found in isolation was E. coli. The majority of those impacted were girls. One-third of the children with UTIs had abnormal ultrasonography results. The most frequent abnormality found on an abdominal USG was bladder abnormality (thickened bladder), which was followed by B/L or U/L hydronephrosis and U/L or B/L hydroureteronephrosis. Poor socioeconomic standing and financial limitations make it difficult to evaluate children with UTIs further.

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