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A STUDY OF URINARY TRACT ABNORMALITIES IN HOSPITALISED CHILDREN PRESENTING WITH URINARY TRACT INFECTION IN MIDNAPORE MEDICAL COLLEGE AND HOSPITAL

Pediatrics

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ABSTRACT

Introduction: Urinary tract infection is the most common bacterial infection in childhood and upto 30% of infants and children experience recurrent infections during the first 6 to 12 months after initial UTI. Urinary tract infections (UTI) imply invasion of urinary tract by pathogens, which may involve the upper or lower urinary tract depending on the infection in the kidney or bladder and urethra.

Aims And Objectives: Children presenting with UTI by Ultrasonography, MCU and / or DMSA depending on the child's age. structural abnormalities and the presence of VUR if any in children with UTI by USG, MCU and DMSA scan in indicated cases.

Materials And Methods: The study was conducted in the Pediatrics ward of Midnapore Medical College and Hospital. This is a tertiary care centre. Pediatric patients from different districts of West Bengal are referred to our Institute. All pediatric patients from 3 months to 12 years of age patients with a diagnosis of, either first episode or recurrent UTI admitted at Midnapore Medical College and Hospital. Our study was an Observational, Prospective study. All the pediatric patients fulfilling the inclusion criteria, admitted to the hospital during the study period was enrolled for the study.

Result And Analysis: We found in abnormal DMSA, the mean age (mean±s.d.) of children was 21.9375 ± 29.1398 years. In normal DMSA, the mean age (mean±s.d.) of children was 24.7321 ± 18.3179. In not required DMSA, the mean age (mean±s.d.) of children was 97.1667 ± 21.9855. Distribution of mean age in years vs. DMSA was statistically significant ($p<0.0001$). In abnormal DMSA,

Conclusion: Even a normal USG report does not rule out dysfunctional bladder as we have had 3 children aged 19 months, 6 months and 26 months who had normal USG findings but clear evidence of VUR on MCU of grades 2 ,4 and 1 respectively.

In conclusion, abnormal US may carry a higher probability of grades III-V VUR and RS, and can affect the management in a significant number of children hospitalized with UTI.

KEYWORDS

INTRODUCTION

Urinary tract infection is the most common bacterial infection in childhood and upto 30% of infants and children experience recurrent infections during the first 6 to 12 months after initial UTI [1]. Urinary tract infections (UTI) imply invasion of urinary tract by pathogens, which may involve the upper or lower urinary tract depending on the infection in the kidney or bladder and urethra [2]. UTI constitutes a common cause of morbidity that in association with abnormalities of the urinary tract, contribute to long-term complications, including hypertension and chronic renal failure. Prompt detection and treatment of UTI and complicating factors are of utmost importance [2]. Urinary tract infection (UTI) is a problem that is frequently encountered by pediatric healthcare providers. Over recent decades, the importance of UTI has been increasingly recognized, in particular the role of UTI as an occult cause of febrile illness in young children.

The incidence of UTI in the term neonate is approximately 1 percent and in the preterm 3 percent, both with male preponderance (male to female ratio of 5:1). During infancy, the risk of developing UTI is equal in boys and girls, and thereafter higher in girls. The risk of developing symptomatic UTI before the age of 14 years is 1 to 2 percent in boys and 3 to 8 percent in girls. The risk of UTI is higher in children with malnutrition and chronic diarrhoea.

Most episodes of UTI during the first year of life are pyelonephritis. Simple cystitis may progress to pyelonephritis. Predicting which patients will develop pyelonephritis is difficult, although evidence suggests that genetics may play a role. Bacterial infections are the most common cause of UTI with 90% of first symptomatic UTI and 70% of recurrent infections due to Escherichia coli Proteus species may be causative in about a third of boys with acute cystitis.

Other organisms including Klebsiella, Staphylococcusepidermidis and Streptococcus faecalis may occasionally be responsible. Proteus and Pseudomonas are associated with recurrent UTI, instrumentation and nosocomial infections. Pathogens of low virulence and fungi may be causative in patients who are immuno compromised. Candida albicans infections are relatively common in preterm infants, immuno compromised children and following prolonged antibiotic therapy [3].

Obstructive lesions may be found in 10 percent of boys investigated for UTI. 30 to 40 percent of patients with UTI show vesicoureteric reflux (VUR). The occurrence of UTI below two years of age, delay in starting treatment and presence of VUR or obstruction are the chief risk factors associated with renal scarring [2]. Since the risk of renal scarring is greatest in infants, any child who presents with a urinary tract infection prior to toilet training should be evaluated for the presence of reflux. Children who may be lost to follow-up and those who have recurrent urinary tract infections should also be evaluated.

The preferred method for evaluation of urinary reflux is a voiding cystourethrogram. Documented reflux is initially treated with prophylactic antibiotics [2]. Patients who have breakthrough infections on prophylaxis, develop new renal scarring, have high-grade reflux or cannot comply with long-term antibiotic prophylaxis should be considered for surgical correction.

Urinary tract infections in children are a significant source of morbidity, particularly when associated with anatomic abnormalities. Vesicoureteral reflux is the most commonly associated abnormality, and reflux nephropathy is an important cause of end-stage renal disease in children and adolescents [2]. Some children who present with an apparently uncomplicated first urinary tract infection turn out to have significant reflux. Subclinical infections can sometimes lead to severe bilateral renal scarring. Therefore, even a single documented urinary tract infection in a child must be taken seriously [2].

1. To evaluate the children presenting with UTI by Ultrasonography, MCU and / or DMSA depending on the child's age.

2. To identify the structural abnormalities and the presence of VUR if any in children with UTI by USG, MCU and DMSA scan in indicated cases.

MATERIALS AND METHODS

Study Site:

The study was conducted in the Pediatrics ward of Midnapore Medical College and Hospital. This is a tertiary care centre. Pediatric patients from different districts of West Bengal are referred to our Institute.

Source Of Data:
All pediatric patients from 3 months to 12 years of age patients with a diagnosis of, either first episode or recurrent UTI admitted at Midnapore Medical College and Hospital.

Study Design:
Our study was an Observational, Prospective study. All the pediatric patients fulfilling the inclusion criteria, admitted to the hospital during the study period was enrolled for the study.

TIMELINE:
This study was conducted between December 2018 and November 2019.

The Inclusion criteria:
1. Infants and children from 3 months to 12 years of age presenting with signs and symptoms of UTI at 1st Episode.
2. Children with recurrence of UTI with documented evidence of similar previous clinical manifestations.
3. Children who come on the first scheduled follow up after discharge from our hospital.

Exclusion Criteria:
1. All children less than 3 months and above 12 years of age presenting with Urinary tract infection .
2. Children previously operated for urological disorders and those with stents for the same.
3. Refusal of the parents to include their children in the study.

Method Of Collection Of Data:
Specialized proforma of case sheet with consent form was prepared which was including details of the history, clinical examination on admission according to the history sheet filled during admission. Each patient was given a code i.e. their hospital ticket registration numbers.

RESULT AND ANALYSIS
Our study showed that 25(26.0%) children were <1 year of age, 45(46.9%) children were 1 to 5 years of age and 26(27.1%) children were >5 years of age. In female, 11(20.8%) child was<1 year of age, 25(47.2%) children were 1 to 5 years of age and 17(32.1%) children were >5 years of age. In male, 14(32.6%) child was <1 year of age, 20(46.5%) children were 1 to 5 years of age and 9(20.9%) children were >5 years of age. Association of age group vs. sex was not statistically significant (p=0.3071). 53(55.2%) children were female and 43(44.8%) children were male. Male : Female ratio was 1:1.232.5(5.2%) children had Acinetobacter sps, 49(51.0%) children had E.coli, 7(7.3%) children had Entercoccus fecalis, 1(1.0%) child had Enterobacter cloacae, 5(5.2%) children had Enterococcus durans, 2(2.1%) children had Enterococcus faecium, 7(7.3%) children had Enterococcus sps, 7(7.3%) children had Klebsiella sps, 2(2.1%) children had Protteus mirabilis, 5(5.2%) children had Pseudomonas Sp, 1(1.0%) child had Serratia fonticola and 5(5.2%) children had Staph. Hemolyticus. 26(27.1%) children had ultrasound –KUB abnormal. 29(30.2%) children had MCU abnormal.

We found in abnormal DMSA, the mean age (mean±s.d.) of children was 21.9375 ± 29.1398 years. In normal DMSA, the mean age (mean±s.d.) of children was 24.7321 ± 18.3179. In not required DMSA, the mean age (mean±s.d.) of children was 97.1667 ± 21.9855. Distribution of mean age in years vs. DMSA was statistically significant (p<0.0001). In abnormal DMSA, 6(37.5%) children were 1 to 5 years of age and 1(6.3%) children were >5 years of age. In normal DMSA, 16(28.6%) children were <1 year of age, 39(69.6%) children were 1 to 5 years of age and 1(1.8 %) children were >5 years of age. Association of age in years vs. DMSA was statistically significant (p<0.0001). In abnormal DMSA, the mean blood urea (mean±s.d.) of children was 24.5625 ± 12.1214. In normal DMSA, the mean blood urea (mean±s.d.) of children was 25.9107 ± 11.7214. In not required DMSA, the mean blood urea(mean±s.d.) of children was 21.2083 ± 5.7633. Distribution of mean blood urea in years vs. DMSA was not statistically significant (p=0.1992).

We showed that in abnormal DMSA, the mean serum creatinine (mean±s.d.) of children was 1.2938 ± 1.5575. In normal DMSA, the mean serum creatinine (mean±s.d.) of children was .9732 ± .3289. In not required DMSA, the mean serum creatinine (mean±s.d.) of children was .8833 ± .2444. Distribution of mean serum creatininein years vs. DMSA was not statistically significant (p=0.1619). In abnormal DMSA, 8(50.0%) children were female and 8(50.0%) children were male.In normal DMSA,28(50.0%) children were female and 28(50.0%) children were male.In not required DMSA, 17(70.8%) children were female and 7(29.2%) children were male.Association of sex vs. DMSA was not statistically significant (p=0.2060). In abnormal DMSA, 14(87.5%) children's had ultrasound-KUB abnormal. In normal DMSA, 12(21.4%) children's had ultrasound-KUB abnormal. In not required DMSA, 24(100.0%) children's had ultrasound-KUB normal. Association of ultrasound-KUB vs. DMSA was statistically significant (p=0.0001).

We found in abnormal DMSA, 16(100.0%) children had abnormal MCU. In normal DMSA, 13(23.2%) children had abnormal MCU.In not required DMSA, 24(100.0%) children's had MCU normal. Association of MCU vs. DMSA was statistically significant (p<0.0001). In abnormal MCU, 26(89.7%) children had abnormal ultrasound-KUB. In normal MCU, 16(100.0%) children had normal ultrasound-KUB.In not required MCU, 51 (100.0%) children had normal ultrasound-KUB. Association of ultrasound-KUB vs. MCU was statistically significant (p<0.0001). In abnormal ultrasound-KUB, higher number of children's 7(26.9%) had MCU VUR grade 4. In normal ultrasound-KUB, higher number of children's 30(42.9%) had normal MCU VUR GR. Association of MCU VUR GRvs. ultrasound-KUB was statistically significant (p<0.0001).

DISCUSSION
Our study was conducted in the Pediatrics ward of Midnapore Medical College and Hospital where children admitted with UTI from 3 months to 12 years of age.

We found that 25(26.0%) children were <1 year of age, 45(46.9%) children were 1 to 5 years of age and 26(27.1%) children were >5 years of age. In females, 11(20.8%) children were <1 year of age, 25(47.2%) children were 1 to 5 years of age and 17(32.1%) children were >5 years of age. In males, 14(32.6%) children were <1 year of age, 20(46.5%) children were 1 to 5 years of age and 9(20.9%) children were >5 years of age. Association of age group vs. sex was not statistically significant (p=0.3071). 53(55.2%) children were female and 43(44.8%) children were male. Male : Female ratio was 1:1.232.

Nair BT et al [4] (2018) found that 370 (37.0%) were females and 630 (63.0%) were males.

Ibeneme CA et al [5] (2014) found that out of a total of 200 children enrolled; nearly 56% (112/200) were males. The mean age of the subjects was 31.14 ± 17.96 months. The prevalence of UTI was 11% and was significantly higher in females than in males (P = 0.049). Children below 12 months of age had a higher rate of UTI than those 12 months and above (P = 0.028).

White B et al [6] (2011) found that acute urinary tract infections are relatively common in children, with 8 percent of girls and 2 percent of boys having at least one episode by seven years of age. The most common pathogen is Escherichia coli, accounting for approximately 85 percent of urinary tract infections in children. Renal parenchymal defects are present in 3 to 15 percent of children within one to two years of their first diagnosed urinary tract infection.

Garout WA et al [7] (2015) found that Escherichia coli (E. coli) was the causative organism in 41.2% of first UTI. The second most common organism was Klebsiella Pneumoniae, seen in 19.6%. Urological anomalies were found in 28.1% of the overall study population.

Our study found that abnormalites
Shabbeera MN et al [8] (2018) found that 105 (33.9%) had abnormal US. Acute DMSA scans were abnormal in 194 children (62.6%), including 89 (45.9%) with concomitant abnormal US. There was VUR in 107 children (34.5%), including 79 (25.5%) with grades III-V VUR. The sensitivity and negative predictive values of US were 52.3% and 75.1%, respectively, for grades I-V VUR; and 68.4% and 87.8%, respectively, for grades III-V VUR. Eighty-five children (27.4%) had RS, including 55 (64.7%) with abnormal US. Of the 105 children with abnormal US, 33 (31.4%) needed subsequent management (surgical intervention, parental counseling, or follow-up of renal function). Nephromegaly on initial US and grades III-V VUR were risk factors of RS. Abnormal US may carry a higher probability of grades III-V VUR and RS, and can affect subsequent management in a significant number of children. Nephromegaly on initial US and grades III-V VUR are

strongly associated with an increased risk for RS.

Simões AC et al [9] (2015) found that febrile infants with UTIs should undergo renal and bladder ultrasonography.

Ditchfield MR et al [10] (1998) found that the frequency of cortical defects and the association between vesicoureteric reflux and the presence of cortical defects in children with urinary tract infection. Eighty-eight patients (68%) had a radiographic micturating cystourethrogram within 6 months of the DMSA scan, and in this group the relationship of defects with vesicoureteric reflux was determined. Overall, 81/258 (31%) of kidneys had a cortical defect on a DMSA scan.

Our study found that in abnormal DMSA, 7 children (43.8%) had VUR grade 4. In normal DMSA, 32(57.1%) children had normal VUR. Those who do not required DMSA, 23(95.8%) children had MCU not required. Association of MCU vs. DMSA was statistically significant (p<0.0001).

We found that in <1 year of age, 2(100.0%) children had normal MCU. In 1 to 5 years of age, 17(37.0%) children had normal MCU . In >5 years of age, 24(50.0%) children had not required MCU. Association of MCU vs. age group was not statistically significant (p=0.1463). In female children19(35.8%) had normal MCU . In male children's 14(32.6%) had normal MCU. Association of MCU vs. sex was not statistically significant (p=0.0737). It was found that 16 children had abnormal a in DMSA scan out of which 12 patients had acute pyelonephritis, scar was found 4 patients and 40 children had normal DMSA.

Prasad MM et al [11] (2012) found that the proper algorithm for the radiographic evaluation of children with febrile urinary tract infection (FUTI) is hotly debated. Three studies are commonly administered: renal-bladder ultrasound (RUS), voiding cystourethrogram (VCUG), and dimercapto-succinic acid (DMSA) scan. Each strategy carries advantages and disadvantages, and some groups now advocate even less of a workup (none of the above) due to the current controversies about treatment when abnormalities are diagnosed. New technology is available and still under investigation, but it may help to clarify the inter play between vesicoureteral reflux, renal scarring, and dysfunctional elimination in the future.

CONCLUSION

We found that urinary tract infection was more common in girls. Escherichia coli (E. coli) was the most common causative organism in 51.0% UTI. The second most common organisms were various species of Enterococcus followed by Klebsiella sps.

It was found that mean age of children was higher in those with abnormal DMSA compared to normal DMSA and this was statistically significant. Lessthe age group, higher is the grade of VUR. We found that association of findings on ultrasound-KUB and MCU vs DMSA were statistically significant. The results of this study highlight that less the age group ,more severe is the grade of VUR.

Even a normal USG report does not rule out dysfunctional bladder as we have had 3 children aged 19 months, 6 months and 26 months who had normal USG findings but clear evidence of VUR on MCU of grades 2 ,4 and 1 respectively.

In conclusion, abnormal US may carry a higher probability of grades III-V VUR and RS, and can affect the management in a significant number of children hospitalized with UTI.

Table: Distribution Of Urine C/S, Ultrasound-KUB, MCU, MCU VUR GR And DMSA

		Frequency	Percent
Urine C/S	E.coli	49	51.0%
	Enterococcus sps	7	7.3%
	Klebsiella sps	7	7.3%
	Entercoccus fecalis	7	7.3%
	Acinetobacter sps	5	5.2%
	Staph. Hemolyticus	5	5.2%
	Enterococcus durans	5	5.2%
	Pseudomonas Sp	5	5.2%
	Enterococcus faecium	2	2.1%
	Protteus mirabilis	2	2.1%
	Serratia fonticola	1	1.0%
	Enterobacter cloacae	1	1.0%
	Total	96	100.0%
Ultrasound-KUB	Abnormal	26	27.1%
	Normal	70	72.9%
	Total	96	100.0%
MCU	Abnormal	29	30.2%
	Normal	16	16.7%
	Not Required	51	53.1%
	Total	96	100.0%
MCU VUR GR	Grade 1	2	2.1%
	Grade 2	6	6.3%
	Grade 3	5	5.2%
	Grade 4	7	7.3%
	Grade 5	4	4.2%
	No Vur	33	34.4%
	Not Required	39	40.6%
	Total	96	100.0%
DMSA	Abnormal	16	16.7%
	Normal	56	58.3%
	Not Required	24	25.0%
	Total	96	100.0%

REFERENCES

1. Update of the approach of UTI in children -Journal de pediatria .jped.2015.05.003 0021-7557/© 2015
2. Protocals in Pediatric nephrology 1st edition -Arvind Bagga.
3. Finnell SM, Carroll AE, Downs SM. Technical report—Diagnosis and management of an initial UTI in febrile infants and young children. Pediatrics. 2011 Sep. 128(3):e749-70.
4. Nair BT, Rai AK. Prevalence of urinary tract infection in febrile children< 2 years of age. Sahel Medical Journal. 2018 Jan 1;21(1):47.
5. Ibeneme CA, Oguonu T, Okafor HU, Ikefuna AN, Ozumba UC. Urinary tract infection in febrile under five children in Enugu, South Eastern Nigeria. Nigerian journal of clinical practice. 2014;17(5):624-8.
6. White B. Diagnosis and treatment of urinary tract infections in children. American family physician. 2011 Feb 15;83(4).
7. Garout WA, Kurdi HS, Shilli AH, Kari JA. Urinary tract infection in children younger than 5 years: etiology and associated urological anomalies. Saudi medical journal. 2015;36(4):497.
8. Shabbeera MN. The Role of Renal Ultrasound in Children With Febrile Urinary Tract Infection. Children. 2018 Sep 6;16:20.
9. Simões AC, Oliveira EA. Update on the approach of urinary tract infection in childhood. Jornal de Pediatria (VersãoemPortuguês). 2015 Nov 1;91(6):S2-10.
10. Ditchfield MR, Nadel HR. The DMSA scan in paediatric urinary tract infection. Australasian radiology. 1998 Nov;42(4):318-20.
11. Prasad MM, Cheng EY. Radiographic evaluation of children with febrile urinary tract infection: bottom-up, top-down, or none of the above?. Advances in urology. 2012;2012.