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ORIGINAL ARTICLE

# Prevalence of urinary tract infection in children with cerebral palsy: Experience at tertiary care centre.

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**ABSTRACT… Objective:** To determine the prevalence of urinary tract infections, causative organisms and culture sensitivity pattern in children with CP. **Study Design:** Cross Sectional Descriptive. **Setting:** The Children Hospital and The Institute of Child Health Multan. **Period:** September 2020 to September 2021. **Material & Methods:** After consent from parents and ethical approval, 52 children diagnosed case of CP, 2-12 years, of both gender were enrolled. Demographic data and socioecononomical status was noted. Type of CP was ascertained. Complete urine examination was sent for microscopy and culture sensitivity. **Results:** Out of 52 children male were prominent with age range of 2-7 years (mean age ± SD, 5.8 years ± 3.27). Mostly children were malnourished, belonged to low socioeconomic status {73.1% (n=38)} and spastic quadriplegic type, {53.8% (n=28)}. UTI was significantly found in 73.1% (n=38) of CP children (p-value=0.002), predominantly in male (76.5%), of 2-7 years of age (66.7%), malnourished (66.6%), with low socioeconomic status (73.7%) and Spastic quadriplegic type (85.7%). No organisms were detected in 52.7% (n=20) of UTI positive children with predominantly E-coli 26.4% (n=10), and was found most susceptible to amikacin, gentamicin, imipenum and meropenum, while least susceptible to Nalidixic acid, Amoxicillin-clavulanic acid, Piperacillin-Tazobactum, cefotaxime and ceftriaxone. Other organisms were, Klebseila pneumonia in 10.1% (n=4), Enterobacter and Pseudomonas Aurigenosa in 5.4% (n=2) children each. Abdominal USG showed positive findings in 63.1% (n=24) children. 16 children detected thick walled urinary bladder, 2 fullness of pelvocalyceal system, 2 echogenic urinary bladder walls, and in 2 echogenic kidneys. **Conclusion:** UTI is common complication which can lead to renal compromise. So all the CP children must be properly screened and managed for UTI to minimize the complications. Appropriate antibiotic must be used to avoid the antibiotic resistance.

**Key words:** Culture Sensitivity, Cerebral Palsy, Socioeconomical Status, Urinary Tract Infection.

## INTRODUCTION

CP is the worldwide commonest disability involving motor and posture in childhood with prevalence of 2-2.5 per 1000 live births, the prevalence has remained stable over the years.[1] CP is classified by Geographical classification, Physiological classification, and Gross Motor Function Classification System (GMFC system).[2] Diagnosis is mostly clinical. Although, the brain damage is not progressing, but its manifestations keep on changing with development of child, resulting in limited participations in the different life areas and activities.[3] Similarly CP is a motor disorder but it has associated problems and complications like poor communication and behavior issues, musculoskeletal problems and epilepsy[3], movement disorders, visual impairment, malnutrition, gastro esophageal reflux, obesity, hydrocephalus, developmental problems and urinary tract infections (UTI).

UTI is the troublesome complication of CP children, which can result in hypertension and renal dysfunction.[4] Due to different factors like poor urinary control and function, vesicoureteral reflux, motor impairment, low cognition, difficulty in postural control, difficulty in communication, and constipation. CP children are more prone for bacterial invasion and increased chance of urinary tract infections.[5] UTI may be asymptomatic

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or manifest as nausea, vomiting, lethargy, fever, failure to thrive, urinary incontinence, urgency, frequency, hesitancy, burning micturition, hematuria, irritability, hypertension and fits.[6]

The prevalence of UTIs in CP patient varies from 8.5%-56.7% in developed world, although lacking data of developing world.[7,8] The commonest responsible organisms are Escherichia coli(E-. coli), Proteus, Enterococcus fecalis, Klebsiella specie, Staphylococcus spp. Amoxicillin and Cotrimoxazole are the commonly prescribed drug, but their resistance also reported.[9]

Unfortunately, there has been less data available about UTI among CP children in Pakistan, and undiagnosed and poorly managed UTIs in CP patients may result in poor outcome. So this study is planned to determining the burden of UTI, its causative organisms, and antibiotic sensitivity pattern among cerebral palsy patients. The research will highlight the burden of the disease and the practitioners will be more confident in managing and decreasing morbidity in CP children with UTI.

## MATERIAL & METHODS

This cross sectional descriptive study was carried out in the department of developmental and behavior pediatrics, CHICH Multan from September 2020 to September 2021. We enrolled 52 children presented with delayed development, abnormal muscle tone, and hyperreflexia, diagnosed as CP, 2 to 12 years, both gender by convenient sampling. The children having Degenerative brain disorders, Myopathies, Neuropathies, Inborn error of Metabolism, chromosomal abnormalities, dystrophies, paralytic poliomyelitis, spina bifida, and did not gave consent, were excluded. These disorders were diagnosed on clinical features, examination findings and available investigations.

For all CP children detailed history was taken from parents/guardian. Demographic information like name, age, gender, contact number was taken. Their socioeconomical status was noted. Families with monthly income <18,000rps were labelled low and >18,000rps as high socioeconomic status. Malnutrition was assessed in each children and those were labelled malnourished who had weight for height less than minus 3SD and mid upper arm circumference less than 11.5cm. Complete neurological examination was done in all children. Type of CP was determined clinically. Urine samples were collected and transferred to hospital laboratory for diagnosis of urinary tract infection and for culture and sensitivity. Urinary tract infection (UTI) was labelled when the quantitative growth of bacteria, greater than or equal to $10^5$ colony forming units per milliliter urine of the same organism, on collected midstream urine specimen. All children were sent to radiology department of the institute for abdominal ultrasound (USG), and it was considered positive/significant findings if one or more of the following were present: thick walled urinary bladder, fullness of pelvocalyceal system, echogenic gall bladder walls, or echogenic kidneys. All the information was noted on already designed Performa.

Informed consent was taken. The study was approved from the ethical committee (No. 409/20) of the hospital. No conflict of interest was involved in this study. No financial support was provided by the institution or pharmaceutical company.

Statistical analysis was done by using SSPS version 20. Percentages (%) were calculated for qualitative data (gender, urinary tract infection, socioeconomic status, type of CP). Mean +_ S.D was calculated for age. Stratification of data was also done-value was calculated by applying Chi square test and P-value <0.05 was considered significant.

## RESULTS

Out of 52 children male were prominent with male to female ratio of 1.8:1. Maximum children were age range of 2-7 years with mean age ± SD, 5.8 years ± 3.27. Socioeconomical status was low in 73.1% (n=38) and high in 26.9% (n=14). 80.8% (n=42) were malnourished, 53.8% (n=28) were spastic quadriplegic, 19.2% (n=10) spastic diplegic, 7.7% (n=4) spastic hemiplegic and dystonic each and 11.5% (n=6) hypotonic type of CP (Table-I). UTI was found in 73.1% (n=38)

of CP patients which was statistically significant (p-value=0.002). (Table-I). Most of the children having UTIs were male (76.5%), of 2-7years of age (66.7%), low socioeconomic status (73.7%) and malnourished (66.6%) (Table-I). Spastic quadriplegic type (85.7%) mostly developed UTI (Table-I).

| UTI Present | Yes n(%age) 38 (73.1) | No n(%age) 14 (26.9) | Total n(%age) 52(100) | P-Value 0.002 |
|---|---|---|---|---|
| Variables | | | | |
| **Age (years)**, mean ± SD, 5.8 years ± 3.27 | | | | |
| **Age groups**<br>2-7 years<br>>7to12years | <br>24(66.7)<br>14(87.5) | <br>12(33.3)<br>2(12.5) | <br>36(69.2)<br>16(30.8) | 0.108 |
| **Total** | 38(73.1) | 14(29.9) | 52(100) | |
| **Sex**<br>Male<br>Female | <br>26(76.5)<br>12(66.7) | <br>8(23.6)<br>6(33.3) | <br>34(65.4)<br>18(34.6) | 0.519 |
| **Total** | 38(73.1) | 14(26.9) | 52(100) | |
| **Socioeconomic status**<br>Low<br>High | <br>28(73.7)<br>10(71.4) | <br>10(26.3)<br>4(28.6) | <br>38(73.1)<br>14(26.9) | 1 |
| **Total** | 38(73.1) | 14(26.9) | 52(100) | |
| **Malnutrition**<br>Present<br>Not-present | <br>28(66.6)<br>10(100) | <br>14(33.3)<br>0(0) | <br>42(80.8)<br>10(19.2) | 0.46 |
| **Total** | 38(73.1) | 14(26.9) | 52(100) | |
| **Type of CP**<br>Sp Quadriplegic<br>Sp diplegic<br>Sp hemiplegic<br>Dystonic<br>Hypotonic | <br>24(85.7)<br>4(40)<br>4(100)<br>4(100)<br>2(333.3) | <br>4(14.2)<br>6(60)<br>0(0)<br>0(0)<br>4(66.6) | <br>28(53.8)<br>10(19.2)<br>4(7.7)<br>4(7,7)<br>6(11.5) | 0.002 |
| **Total** | 38(73.1) | 14(26.9) | 52(100) | |

**Table-I. Baseline characteristics of all children (N =52 )**

No organisms were detected in 52.7% (n=20) of UTI positive children while E-coli in 26.4% (n=10), Klebseila pneumonia in 10.1 % (n=4), Enterobacter and Pseudomonas Aurigenosa in 5.4% (n=2) children each (Table-II) on culture of urine-E-coli was sensitive. There was no mixed growth. Abdominal USG showed positive findings in 63.1% (n=24) children. (Table-II). Out of 24 children with positive findings, 16 children detected thick walled urinary bladder, 2 fullness of pelvocalyceal system, 2 echogenic urinary bladder walls, and in 2 echogenic kidneys.

E-coli was 100% susceptible to amikacin, gentamicin, nitrofurantine, doxycillin imipenum and meropenum, while least susceptible to Nalidixic acid, Amoxicillin-clavulanic acid, Piperacillin-Tazobactum, cefotaxime and ceftriaxone, levofloxacin, and fosfomycin. Klebsiela was 100% susceptible to cefotaxime, ceftriaxone and fosfomycine, nitrofurantin and doxycycline and 50 % to Amoxicillin-clavulanic acid, Piperacillin-Tazobactum, levofloxacin, Amikacin, and Gentamycin while it was resistant to naladixic acid. Fosfomycine, nitrofurantine and doxycycline sensitivity was 100% for Enterobacter, while this organism was 100% non susceptible for Amikacin, Gentamycin,

Imipenem, Meropenem, Nalidixic acid and ciprofloxacin. Pseudomonas was most sensitive to Gentamycin, Imipenem, Meropenem, Nalidixic acid, Ceftriaxone, Cefotaxamine, Ciprofloxacin, Fosfomycine, Levofloxacin, Nitrofurantion, and Doxycyline,and least susceptible to Amoxicillin-clavulanic acid and Piperacillin-Tazobactum, naladixic acid. (Table-III)

| Culture No(%age) | P-value |
|---|---|
| No growth 20(52.7)<br>Klebseilla 4(10)<br>Enterobacter 2(5.3)<br>E-coli 10(26.3)<br>Pseudomonas 2(5.3) | 0.006 |
| **USG Findings**<br>Positive 24(63.1)<br>Negative 14(36.8) | <0,001 |

**Table-II. Urine culture and USG findings of children with UTI(n=38)**

## DISCUSSION

It is the first ever research done in this region (south Punjab) according to my knowledge which highlight the importance of detecting and managing UTIs in CP. According to my study UTI is found in 73.1% (n=38) of CP children, which is almost same to some other studies. 56.7% of CP children were found positive for UTI by Silva et al[10], and it was found 60.2% by other researcher.[11] While a study carried in Lahore showed 34% CP children with UT[12], and 38.5% in Nigeria which is lower prevalence compared to current one.[13] This difference may be due to different inclusion criteria especially age, type and severity of CP. The children with CP has more chance of UTI as compared to children without CP, due to different factors described earlier.[5]

| Organism | E-coli | Klebseila | Enterobacter | Pseudomonas |
|---|---|---|---|---|
| **Drug Response** | **S R**<br>**n(%age) n(%age)** | **S R**<br>**n(%age) n(%age)** | **S R**<br>**n(%age) n(%age)** | **S R**<br>**n(%age) n(%age)** |
| AC | 2 (20) 4(40) | 2(50) 0(0) | NA | 0(0) 2(100) |
| PT | 2(20) 4(40) | 2(50) 0(0) | NA | 0(0) 2(100) |
| Am | 6(60) 0(0) | 2(50) 0(0) | 0(0) 2(100) | 0(0) 0(0) |
| Ge | 6(60) 0(0) | 2(50) 0(0) | 0(0) 2(100) | 2(100) 0(0) |
| Im | 6(60) 0(0) | NA | 0(0) 2(100) | 2(100) 0(0) |
| Me | 6(60) 0(0) | NA | 0(0) 2(100) | 2(100) 0(0) |
| Na | 0(0) 6(0) | O(0) 2(50) | 0(0) 2(100) | 2(100) 1(50) |
| TF | 0(0) 4(40) | NA | NA | NA |
| Cf | 2(20) 4(40) | 4(100) 0(0) | NA | 2(100) 0(0) |
| Ce | 2(20) 4(40) | 4(100) 0(0) | NA | 2(100) 0(0) |
| Ci | 4(40) 2(20) | NA | 0(0) 2(100) | 2(100) 1(50) |
| Fo | 4(40) 2(20) | 4(100) 0(0) | 2(100) 0(0) | 2(100) 0(0) |
| Le | 4(40) 2(20) | 2(50) 0(0) | 0(0) 2(100) | 2 (100) 0(0) |
| Ni | 6(60) 0(0) | 4(100) 0(0) | 2(100) 0(0) | 2(100) 0(0) |
| Do | 6(60) 0(0) | 4 (100) 0(0) | 2(100) 0(0) | 2(100) 0(0) |

**Table-III. Culture and sensitivity pattern of organisms**

Amoxicillin-clavulanic acid=AC, Piperacillin-Tazobactum=PT, Amikacin=Am, Gentamycin=Ge, Imipenem=Im, Meropenem=Me, Nalidixic acid=NA, Trime-sulphamethoxazole=TS, Ceftriaxone=Cf, Cefotaxamine=Ce, Ciprofloxacin=Ci, Fosfomycine=Fo, Levofloxacin= Le, Nitrofurantion= Ni, Doxycycline=Do, NA=not applied

In present study among the CP children having UTI most were male. High occurrence of UTI was found in children with age range 2-7years with obvious malnutrition. Most families with these children belonged to low socioeconomical status. Spastic quadriplegic CP was most common type having UTI and E-coli was detected predominantly on culture of urine, followed by enterobacter, klebseila and pseudomonas. Few studies[12,13] showed similar results regarding gender, type of CP and E-coli as culture positive organism, but one involved elder children having more UTI as compared to current study.[12] A study done in Tanzania has also detected E-coli as major causative organism like our study, most CP children were male, malnourished, and of spastic quadriplegic type but it has lower prevalence rate as compared to ours.[14] Spastic quadriplegic CP are more prone to develop UTI because of more gross motor delay and less mobility level.

In current study 24(63.1%) CP children with UTI showed significant findings on USG of abdomen like thick walled urinary bladder, fullness of pelvocalyceal system, echogenic gall bladder walls, or echogenic kidneys. While in a study done in Nigeria detected normal USG findings in 20CP patients, and abnormalities like thickened or irregular bladder wall, and residual urine in 2 children.[13]

Our study detected most common organism E-coli, which was highly resistant to first line antibiotics, i.e. Amoxicillin-clavulanic acid, and also to Nalidixic acid, Piperacillin-Tazobactum, cefotaxime and ceftriaxone, which are used in severe cases, and it is sensitive to amikacin, gentamicin, ciprofloxacin, imipenum and meropenum. Other studies showed highly resistant pattern of E-Coli to co-trimoxazole and ampicillin, and sensitive to ciprofloxacin and ceftriaxone.[13,14,15,16]

There may be certain reasons why E-Coli is becoming less susceptible rather resistant to 1st line antibiotics as found in current and few other studies[14,17,18,19] Primary health care persons frequently use 1st line antibiotics. Doses of antibiotics may be inadequate or low standard medications being used, which is important factor especially in developing countries.[17] Self-medication is very common practice in our setup. Lastly microorganism itself develop resistant against particular drug. Quinolones, nitrofurantine, and doxycycline are found sensitive to most of the organisms, because these antibiotics are used very cautiously and rarely in children. Similarly parenteral routes of Gentamycin and Amikacin results in their less prescription and so preserved sensitivity.

## LIMITATION OF STUDY

Our study includes CP patients presented to one hospital. Study may be planned to get data from more hospitals to cover larger population. The result of Culture and Antibiotic sensitivity in current study is determined only by available kits in hospital laboratory. We have not performed urodynamic studies of our children Blood drug levels were not measured.

## CONCLUSION

As UTI is common complication and remains unidentified in most of the CP children, which can lead to renal compromise, So it is important to screen CP children for UTI as a baseline investigation and also on follow up to minimize the complications and morbidity. Appropriate antibiotic must be used to avoid the antibiotic resistance.



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