

## Epidemiological-Clinical Aspects of Bacterial Urinary Tract Infections in Children from 2 to 15 Years at the Nianankoro Fomba Hospital in Ségou

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### Abstract

**Introduction:** Bacterial urinary tract infection is the microbial invasion of symptomatic urine and inflammation of the structures of the urinary tree. The aim of our work was to study the epidemiological and clinical aspects of bacterial urinary tract infections in children aged 2 to 15 years at the Nianankoro Fomba Hospital in Ségou. **Material and Method:** This was a descriptive and analytical cross-sectional study of bacterial urinary tract infections in 2 to 15 year olds at Nianankoro Fomba Hospital in Ségou from September 2018 to August 2019. **Results:** During our study period on 2111 children between 2 and 15 years old admitted to the ward, we collected 71 cases of bacterial urinary tract infections, a hospital frequency of 3.36%. There was a male predominance with a sex ratio of 2.33. The age group of 2 to 5 years predominated with 52.11%. Urine strips were used in all patients with a positivity rate of 98.4%. On cytobacteriological examination of urine there was leukocyturia in 86% and hematuria in 85.6% of cases, at culture there was a predominance of *Escherichia coli* in 54.7%. The most common diagnosis was pyelonephritis with 53.5%, the most frequently used antibiotics were amoxicillin plus clavulanic acid in 50.70%. The cure rate was 97.05% of cases; however two patients or 2.65% had acute complications to kidney abscess type. **Conclusion:** Bacterial urinary tract infection is a common pathology in pediatrics. Our study made it possible to approach this pathology in a global way, which mainly affects infants and young children in whom diagnosis remains difficult given the non-specificity of clinical signs. The cure is almost total however complications can occur requiring multidisciplinary management.

**Keywords:** Urinary tract infection; children; Ségou.

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## INTRODUCTION

Bacterial urinary tract infection is the symptomatic microbial invasion of the urine and inflammation of the structures of the urinary tract. It is one of the most common bacterial infections in general practice, after respiratory infections, and the most frequently encountered in both community and hospital settings with a rate of 40%. It occurs in both adults and children and is often associated with a functional or anatomical abnormality of the urinary tract [1].

The prevalence of UTI in children depends on multiple factors, including age and gender; it is more common in boys under the age of 3 months and more common in girls over the age of 1 year. In 1/3 of cases, UTI in children is related to a malformation of the urinary tract [2]. The signs and symptoms of UTI are often non-specific, especially in newborns and infants. The most frequently isolated germs are Enterobacteriaceae 81% and Gram-positive cocci 12.9%. Streptococci and Enterococci are increasingly encountered during UTIs in developing countries due to

the low level of education of the population on sanitary hygiene [3].

In Marrakech in 2009 the frequency of UTI was 1.33% [2]. In Togo, in a study carried out from 4 January 1989 to 31 December 1997 in the pediatric department of the CHU Campus de Lomé, the prevalence of urinary tract infection was 8.29%; 19.43% of children presented with complications and the mortality rate was 3.43% [4].

In Mali, in a study carried out between 2005 and 2006 in the nephrology department of the CHU POINT G, urinary tract infections were the third most common cause of fever, with a female predominance of 33% compared to 26% for males [5].

We wanted to study bacterial urinary tract infection in pediatric hospitals to contribute to the accuracy of clinical epidemiological data.

## METHODOLOGY

This was a cross-sectional and descriptive study from September 2018 to August 2019 in children aged 2 to 15 years in the pediatric department of the HNF of Segou, which is a second referral hospital according to the health pyramid of Mali.

All children aged 2 to 15 years hospitalized and not hospitalized in the department with a bacterial urinary tract infection were included.

The data were collected on an individual survey form that had been drawn up in advance. The following variables were collected: socio-demographic data of the parents (age, level of education, profession and residence of the parents), socio-demographic data, clinical data of the children (age, sex, ethnicity, reason, vaccination status, anthropometric measurements, signs of the physical examination, results of complementary examinations) Text processing and tables were carried out on Word 2016 software. Data analysis was performed using SPSSversion12 .0 software. From an ethical point of view, we obtained the informed verbal consent of the parents or carers and with the agreement of the hospital's administrative authorities.

Urine samples were collected midstream after meatus or vulva cleansing depending on gender and before any antibiotic therapy. All samples with a positive urine dipstick were sent immediately to the hospital laboratory for urine cytobacteriological examination (UCT) followed by culture on different agars.

Technical procedure for performing the urine test strips (UDT):

1. Dip the strip into the urine up to the test area for less than two seconds.

2. Pull the edge of the strip along the rim of the container to remove excess urine, but ensure that the reactive pads do not come into contact with the rim of the container.
3. Turn the strip on its side and tap once on a piece of absorbent cloth to remove any residual urine; excess urine on the strip may cause chemicals to interact between adjacent reagent pads, so an incorrect result may occur.
4. Compare the colors of the reagent pads exactly after 60 seconds (leucocytes after 90-120 seconds) with the color chart on the bottle label in good light while comparing, keeping the strip horizontal to avoid possible mixing of chemicals in case of excessive urine.

## RESULTS

### Descriptive Results

During our study period, out of 2111 children between 2 and 15 years of age admitted to the department, we recorded 71 cases of urinary tract infections, i.e. a hospital frequency of 3.36%, with a predominance of males with a sex ratio of 2.33. The 2 to 5 year old age group predominated with 52.11%, followed by the 10 to 15 year old age group with 38.03% (Table I). The most frequent reason for consultation was urinary burning associated with fever in 30% of cases; despite the referral and evacuation system, 76% of patients came on their own and 56.3% consulted between 24 and 72 hours after the appearance of the first signs (Table I). Almost all patients had been correctly vaccinated according to the schedule of the extended vaccination programme (97%).

The blood count showed moderate anemia in 81.7% of cases, severe anemia in 9.9%, and hyperleukocytosis in 52.1% of cases. The sedimentation rate was accelerated in the first hour in 70% of cases. Urine dipsticks were used in all patients with a positivity rate of 98.4% (Table II).

On cytobacteriological examination of the urine, leucocyturia was noted in 86% of cases and haematuria in 85.6% of cases. On culture, *Escherichia coli* was predominant in 54.7% of cases, followed by *Salmonella* sp in 25.4% and *Staphylococcus aureus* in 11.4%, *Klebsiella pneumoniae* was isolated in 5 patients (7.9%) and *Proteus* in one patient (1.4%) (Table II).

Conditions such as vesico-urethral reflux, syndrome, genital infection and HIV were associated with UTI in about 10% of our patients and malformative uropathy accounted for about 43% of these associated conditions. The most frequent diagnosis was pyelonephritis with 53.5%, the most frequently used antibiotics were amoxicillin plus clavulanic acid in 50.70% followed by Cefixime in 32.39% (Table I).

The cure rate was 97.05%, however two (2) patients (2.65%) presented acute complications such as

kidney abscesses, which were successfully referred to the hospital's urology department (Table I).

**Table I: Socio-demographic and clinical characteristics**

<b>Socio-demographic and clinical characteristics</b>	<b>Number</b>	<b>%</b>
<b>Age</b>	71	100
2- 5 years	37	43,66
5- 10 years	7	9,8
10 – 15 years	27	39,4
<b>Sex</b>	70	100
Male	50	70
Female	21	30
<b>Mode of admission</b>	<b>71</b>	<b>100</b>
<b>No Referrals</b>	54	76
<b>Referred</b>	17	24
<b>Time to consultation</b>	<b>71</b>	<b>100</b>
<b>Less than 24 hours</b>	18	25,4
24 - 72 hours	40	56,3
3 days - 7 days	13	18,3
<b>Diagnosis</b>	<b>71</b>	<b>100</b>
Acute pyelonephritis	38	53,5
Cystitis	33	46,5
<b>Treatment</b>	<b>71</b>	<b>100</b>
Amoxicillin + Clavulanic acid	39	54,9
Cefixime	23	32,39
Ciprofloxacin	10	14,1
Amoxicillin	1	1,4
<b>Associated diseases</b>	<b>71</b>	<b>100</b>
Vesico-urethral reflux	3	4,22
Nephrotic syndrome	2	2,81
Vulvitis	1	1,40
HIV	1	1,40
No associated pathology	64	90,12
<b>Immediate outcome</b>	<b>71</b>	<b>100</b>
Cured	69	97,05
Acute complications	2	2,65

**Table II: Distribution of patients by biological and radiological characteristics**

<b>Biological and radiological characteristics</b>	<b>Number</b>	<b>%</b>
<b>Hemoglobin level</b>	<b>71</b>	<b>100</b>
Below 7g/dl	7	9,9
7 to 11g/dl	58	81,7
Above 11g/dl	6	8,5
<b>Hematocrit level</b>	<b>71</b>	<b>100</b>
Less than 35	20	28,2
Between 35% and 50	44	62
More than 50%.	7	9,8
<b>White blood cell count</b>	<b>71</b>	<b>100</b>
Less than $3,510^3$	1	1,4
Between $3,510^3$ to $1010^3$	33	46,5
Greater than $1010^3$	37	52,1
<b>Sedimentation rate</b>	<b>71</b>	<b>100</b>
Accelerated	21	30
Not accelerated	50	70
<b>Urine strip result</b>	<b>71</b>	<b>100</b>
Positive	70	98,4
Negative	1	1,6

<b>Biological and radiological characteristics</b>	<b>Number</b>	<b>%</b>
<b>EBCU results</b>	<b>71</b>	<b>100</b>
Escherichia coli	39	54,9
Salmonella sp	18	25,4
Staphylococcus aureus	8	11,4
Klebsiella pneumoniae	5	7,9
Proteus	1	1,4
<b>Ultrasound result</b>	<b>71</b>	<b>100</b>
Normal	36	50,7
Cystitis	30	42,3
Hydronephrosis	2	2,8
Malformative uropathies	3	4,2

## DISCUSSION

During our study period, out of 2111 children consulted in the department, we recorded 71 cases of bacterial urinary tract infection, i.e. a hospital frequency of 3.36%.

Our results are higher than those reported in 2007 by A. L Robinson *et al.*, in Madagascar and RAMI A in 2009 in Morocco who found respectively 1.8% and 0.2% and lower than those found by Traoré H in 2006 at the CHU of Point G who found a frequency of 10.7% [6, 7, 5].

Children aged 2 to 5 years accounted for almost half of the cases. Our results are contrary to those of S. Diouf *et al.*, in 2005 in Senegal and H. TRAORE in 2006 in Mali who respectively found a higher frequency of urinary tract infections in children aged 5 to 10 years [8, 5]. This difference could be explained by our study population.

In our study there was a predominance of males with a sex ratio of 2.38. Our results are comparable to those of our study population.

Our results are comparable to those of M. Sylla in 2002 in Niger who found a male predominance, but are contrary to those of Kessie *et al.*, in 2002 in Togo who found a female predominance of urinary tract infections in malnourished children. This difference could be explained by the study population [9, 10].

In our study more than half of the patients had fever; in almost all cases this fever was associated with other signs such as burning of the urine, abdominal pain, pollakiuria and anorexia. Our results are similar to those of Cohen R *et al.*, who found fever in 57.02% and 61.40% of patients but lower than those of S. Diouf *et al* who found fever in 22.04% of patients [11, 8].

Vesico-ureteral reflux (4.22%), nephrotic syndrome (2.81%), phimosis (1.4%), vulvitis (1.4%) and HIV infection (1.4%) were the main associated pathologies. Vesico-ureteral reflux in this context could be explained by the congenital anomaly of the formation of the uretero-vesical junction. In contrast to

our study, in India in 2004, Banapurmath CR and Jayamony S found a higher frequency of malnutrition with (31.8%) of cases [12]. Our results were lower than those found in Cote d'Ivoire in 2011, by Mutumbo T *et al.*, who recorded 46 (25.1%) HIV positive cases out of 183 cases of UTIs in malnourished children [13]. In all of our patients the urine dipstick was positive. This is a very accessible, inexpensive and easy to use test with a sensitivity of about 80% and a specificity of 20%. Our results are similar to those of A. Rami in Morocco in 2009, who found a positive strip in all of these patients [7].

In children aged 2 to 5 years Escherichia coli was isolated in more than half of the children as well as Salmonella, while Escherichia coli was isolated in less than half of the children aged over 5 years. Our results are superior to those of Kessie K *et al.*, [10] who found, in 2002, in Togo, a predominance of Escherichia. Coli with 33.3%; but similar to those of R. Cohen [10, 11] who found in 2006 in Paris, a predominance of Escherichia. coli with 54.8% and lower than those of Bernard Lobel and Claude James Soussy [14] who in a study carried out in 2007 in France found a predominance of Escherichia. coli with 84.6%. Despite the disparity of the results, they confirm the importance of Escherichia coli in urinary tract infections in this population.

In our study there was a statistically significant relationship between the germs isolated and the age groups, our result is contrary to those of B. Lobel in 2007 who did not find a relationship between germs and age group [14]. More than half of our patients were diagnosed with acute pyelonephritis with 53.5%. Our results were contrary to those of H. Traore in Mali who found cystitis in the majority of these patients in 2005 [5], but similar to those of A. Traoré in Mali in 2004 [15].

Amoxicillin plus clavulanic acid was the most commonly used antibiotic, with 50.7% followed by Cefixime 32.39%, Ciprofloxacin 14.1% and amoxicillin 1.4%. Our results are similar to those of M. Sylla in 2002 in Niger who found a predominance of amoxicillin plus clavulanic acid in these patients [9];

but contrary to those of E. Diarra in Mali who found a predominance of ciprofloxacin in his treatment [16]. The duration of treatment was 7 to 10 days in all patients.

In our study, almost all patients were cured without complications; however 2 children had a complication (2.65%) requiring surgery. Our results were inferior to those of A. Diallo in 2006 at Gabriel Touré Hospital in Mali, who found complications in 2.85% and 5.71% of deaths [8]. The complications were linked, on the one hand, to the extension of the infection to a kidney; but also, we can establish the link with the late referral of children, which mortgages the vital prognosis of these patients.

## CONCLUSION

Urinary tract infection is a frequent pathology in pediatrics. Our study has allowed us to approach this pathology in a global way, which essentially affects infants and young children in whom the diagnosis remains difficult due to the non-specificity of clinical signs. The cure is almost complete, but complications may arise, requiring multidisciplinary management.

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**Conflict of Interest:** None

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