Management of Urinary Tract Infections in Adults Hospitalized at Departmental and Teaching Hospital of Borgou-Alibori: Retrospective Analysis from 2013 to 2022

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Abstract

Introduction: Urinary Tract Infections (UTIs) are community-acquired infections frequently encountered in hospitals. The aim of this study was to investigate the diagnostic, therapeutic and evolutionary aspects of urinary tract infections among hospitalized patients in the internal medicine department of DTH-BA.

Methods: This was a descriptive cross-sectional study that systematically included all patients hospitalized for urinary tract infection from January 1st, 2013 to December 31, 2022. Data on diagnosis, treatment and outcome were collected from patient's medical records. A team of experts (infectiologist and microbiologist) assessed the quality of antibiotic therapy (justification, relevance of choice, appropriateness). This study was approved by the local biomedical research ethics committee of the University of Parakou. Data were analyzed using SigmaPlot 14.0 software.

Results: A total of 2876 records were analysed, with 183 cases of urinary tract infection, representing a frequency of urinary tract infection in hospitalized patients of 6.36%. The sex ratio was 0.74 and the mean age 40.55 ± 17.53 years. The most common symptoms were fever (134 cases; 73.22%), asthenia (93 cases; 50.82%) and urinary burning (82 cases; 44.81%). The diagnosis was pyelonephritis in 71 (38.80%) patients, acute cystitis in 68 (37.16%) patients and male urinary tract infection in 42 (22.95%) patients. Of 173 (94.54%) Urine Dipsticks (UD) performed, 159 (91.91%) were positive. A Urine Cytobacteriological Examination (UCE) was performed in 37 (20.22%) patients, 32 (86.49%) of them after initiation of antibiotic therapy. A germ was identified in 15 cases (40.54%). *Escherichia coli* was the most frequent germ (8 cases; 53.33%). In terms of treatment, 182 (99.45%) patients received probabilistic antibiotic therapy, with 133 (73.08%) patients receiving inappropriate management and 14 (93.33%) of the 15 who received an antibiotic susceptibility test being unsuitable. One hundred twenty-four (67.76%) patients were cured, 10 (5.46%) died and 49 (26.78%) were discharged against medical advice.

Conclusion: This study shows that urinary tract infections are managed with probabilistic and inappropriate antibiotics. This result should prompt the development of a protocol for the management of these infections, to ensure the correct use of antibiotics in this department.

Keywords: Urinary tract infection • Diagnosis • Antibiotic therapy • Outcome • Parakou • Benin

Introduction

Urinary Tract Infections (UTIs), a frequent and often complex health problem, represent a major challenge for healthcare professionals [1]. These conditions affect more than 150 million patients every year [2] resulting in a significant medical burden. In the face of ever-increasing antimicrobial resistance, the management of UTIs requires particular attention [3,4]. The management of UTIs is well codified and varies according to the diagnosis, severity, gender and age of the patient. An ad hoc prevalence survey of antibiotic prescribing at the Departmental and Teaching Hospital of Borgou-

Alibori (DTH-BA) revealed that 70.34% of hospitalized patients received antibiotic therapy, which was empirical in 98.41% of cases. This survey also noted the absence of a therapeutic protocol and a guide to the proper use of antibiotics in several hospital departments, including internal medicine [5]. It is in this context that this study was initiated to investigate the diagnostic, therapeutic and evolutionary aspects of urinary tract infections, in order to stimulate in-depth reflection on current practices, with a view to proposing recommendations and avenues of improvement for more efficient, uniform and appropriate management of urinary tract infections within the said department.

Methods

Type of study

This is a descriptive cross-sectional study with retrospective data collection over a ten-year period (from January 1st 2013 to December 31 2022).

Inclusion criteria

Patients included were subjects hospitalized and managed for UTI on the ward during the study period.

Non-inclusion criteria

Patients not included in this study were subjects hospitalized during the study period but not presenting with a urinary tract infection.

Exclusion criteria

Excluded patients were those whose records were illegible or incomplete.

Sampling technique

This was an exhaustive sampling.

Course of the study

Firstly, all files from January 1st 2013 to December 31st 2022 were analysed to identify all patients diagnosed with a urinary tract infection. Secondly, a pre-established data collection form was used to collect sociodemographic, clinical, paraclinical and evolutionary data. To assess the quality of UTI management in the department, an expert opinion on antibiotic therapy was sought from an infectiologist and a microbiologist. This enabled us to assess the quality of antibiotic therapy for each case, in line with local and regional recommendations and the standards and principles of curative antibiotic therapy for urinary tract infections [6].

Thus, the assessment criteria defined were : inappropriate monotherapy (when a combination of antibiotics was indicated and not used), inappropriate antibiotic therapy (when the antibiotic chosen is not recommended for the diagnosis made or for empirical treatment, or when the antibiotic is not the best choice according to the results of the antibiogram), unjustified combination (when a combination of antibiotics is prescribed when it is not necessary) and, finally, inappropriate combination (when the combination is indicated but the choice is inappropriate).

Statistical processing and analysis

After collection, data were checked and entered into kobo toolbox v2022.1.2. Data analysis was carried out using Sigma Plot 14.0 (2017). Text processing and tables were created using Microsoft Word and Excel version 2019. Qualitative variables were expressed as headcount and percentage and quantitative variables as mean ± standard deviation or median with extreme values.

Ethical considerations

The study was conducted after submission of the research protocol to the local biomedical research ethics committee (CLERB) of the University of Parakou, which approved it. Patient consent was not required for the study, whose data collection was based essentially on medical records. All data collected were treated confidentially and anonymously.

Results

## Epidemiological characteristics of urinary tract infections

Out of a total of 2876 patients hospitalized in the department during the 10-years study period, 183 cases of urinary tract infections were hospitalized, representing a frequency of 6.36%. Females were most represented (57.38%), giving a sex ratio of 0.74. The most prevalent age group was between 25 and 50 years (n=92; 50.27%) and the mean age was 40.55 ± 17.53 years, with extremes of 15 and 92 years. Table 1 shows the epidemiological and general characteristics of the patients.

Clinical, paraclinical and diagnostic features

Fever, with 43 (23.50%) cases, was the main reason for hospitalization (Figure 1). On admission, the most frequent symptoms were fever (134; 73.22%), asthenia (93; 50.82%) and urinary burning (82; 44.81%) (Table 2). With regard to physical signs, 72 patients had costolumbar pain (39.34%). A Urine Dipstick (UD) was performed in 173 patients (94.54%) and was positive in 159 (91.91%). There were 118 cases of leukocyturia+nitrituria (74.21%) and 32 cases of isolated leukocyturia (20.13%).

Table 1. General characteristics of subjects with urinary tract infections (N=183).

		Numbers	%
Age	< 25 years	36	19.67
	25-50 years	92	50.27
	50-75 years	47	25.68
	>75 years	8	4.37
	Total	183	100
Gender	Female	105	57.38
	Male	78	42.62
	Total	183	100
Profession	Craftsman	48	26.23
	Housekeeper	42	22.95
	Retailer	35	19.13
	Student	17	9.29
	Civil servant	13	8.74
	Unemployed	7	3.82
	Not specified	18	9.84
	Total	183	100
Marital Status	In couple	108	59.02
	No couple	27	14.75
	Not specified	48	26.23
	Total	183	100
Private Lot	High blood pressure	33	18.03
	Diabetes	32	17.49
	Alcoholism	25	13.66
	Pregnancy	18	9.84
	Sickle cell disease	11	6.01
	Smoking	10	5.46
	HIV	6	3.28
	Prostate adenoma	6	3.28
	Renal insufficiency	4	2.19
	Other	15	8.20
	None	58	31.69
	Total	183	100
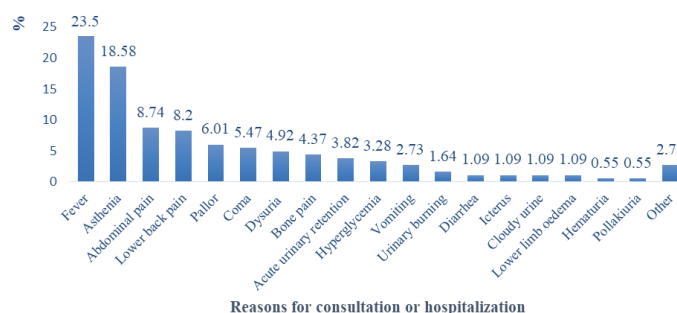
Figure 1. Distribution of UTI sufferers by reason for consultation or hospitalization (N=183).

Of the 183 cases of urinary tract infection recorded, the diagnoses given were acute pyelonephritis in 71 patients (38.80%), acute cystitis in 68 patients (37.16%) and male urinary tract infection in 44 patients (24.04%).

Urine Cytobacteriological Examination (UCE) was performed in 37 patients (20.22%), including 32 (86.49%) after antibiotic therapy was started in the department. *E. coli* was the most isolated germ (8 cases; 53.33%), followed by 2 cases of *Klebsiella* spp (13.33%). Table 3 shows the ECBU results.

Antibiotic susceptibility testing showed resistance to several antibiotics. *E. coli* resistance to amoxicillin+clavulanic acid, ciprofloxacin, ceftriaxone and fosfomycin was 91.67%, 41.67%, 62.50% and 57.14% respectively (Table 4). Renal and urinary tract ultrasonography revealed abnormalities in 61.11% of cases, with renal distress dominating (50%).

Table 2. Functional signs presented by UTI patients on admission (N=183).

	Numbers	%
Fever	134	73.22
Asthenia	93	50.82
Urinary burning	82	44.81
Vomiting	71	38.80
Pollakiuria	54	29.51
Dysuria	43	23.50
Abdominal pain	40	21.86
Lower back pain	40	21.86
Thrill	35	19.13
Diarrhea	23	12.57
Headaches	19	10.38
Coma	10	5.47
Acute urinary retention	9	4.92
Cloudy urine	8	4.37
Curvature	7	3.82
Bone pain	7	3.82
Coca-Cola urine	6	3.27
Constipation	5	2.73
Convulsions	5	2.73
Pallor	5	2.73
Pelvic pain	4	2.19
Dizziness	4	2.19
Other	34	18.58

Table 3. Results of cytobacteriological examination of urine of subjects with urinary tract infection on admission (N=37).

		Numbers	%
Urine Appearance	Disorder	17	45.95
	Lemon yellow	14	37.84
	Dark yellow	5	13.51
	Thematic	1	2.70
	Total	37	100
Hematuria (≥10^4 RBC/mm³)	Yes	8	21.62
	No	29	78.38
	Total	37	100
Leukocyturia (≥10^4/mm³)	Yes	27	72.97
	No	10	27.03
	Total	37	100
Bacteriuria (≥10^3/mm³)	Yes	12	32.43
	No	25	67.57
	Total	37	100
Gram Staining	Positive	3	8.11
	Negative	12	32.43
	No germs identified	22	59.46
	Total	37	100
Identified Germs	*E. coli*	8	53.33
	Klebsiella spp	2	13.33
	S. coagulase negative	1	6.67
	Acinetobacter b.	1	6.67
	Unidentified germ	1	6.67
	Gram-positive cocci	1	6.67
	Citrobacter freundii	1	6.67
	Total	15	100

Table 4. Resistance profile of isolated uropathogens to the antibiotics tested.

	E. coli (N. %)	Klebsiella spp (N. %)	Acinetobacter baumannii (N. %)	Citrobacter freundi (N, %)	S. coagulase Negative (N, %)	Overall Resistance Rate (N, %)
Amoxicillin+Clavulanic acid	7(87.5)	1(50)	1(100)	1(100)	1(100)	11(91.67)
Ampicillin	6(75)	1(50)	1(100)	1(100)	1(100)	10(100)
Ceftazidime	5(62.5)	0(0)	1(100)	1(100)	0(0)	7(70)
Chloramphenicol	4(50)	1(50)	1(100)	0(0)	1(100)	7(70)
Gentamicin	5(62.5)	0(0)	0(0)	0(0)	1(100)	6(54.55)
Ciprofloxacin	3(37.5)	1(50)	0(0)	0(0)	1(100)	5(41.67)
Ceftriaxone	4(50)	0(0)	0(0)	1(100)	0(0)	5(62.50)
Cefepime	3(37.5)	1(50)	1(100)	0(0)	0(0)	5(62.50)
Norfloxacin	3(37.5)	0(0)	0(0)	0(0)	1(100)	4(57.14)
Fosfomycin	3(37.5)	0(0)	1(100)	0(0)	0(0)	4(57.14)
Aztreonam	1(12.5)	0(0)	1(100)	1(100)	1(100)	4(66.67)
Cefuroxime	2(25)	1(50)	0(0)	0(0)	1(100)	4(80)
Nethilmicin	1(12.5)	1(50)	0(0)	1(100)	1(100)	4(100)
Doxycycline	2(25)	0(0)	1(100)	1(100)	0(0)	4(100)
Erythromycin	2(25)	0(0)	0(0)	0(0)	1(100)	3(75)
Cotrimoxazole	3(37.5)	0(0)	0(0)	0(0)	0(0)	3(100)
Levofloxacin	3(37.5)	0(0)	0(0)	0(0)	0(0)	3(100)
Cefixime	1(12.5)	0(0)	1(100)	1(100)	0(0)	3(60)
Amikacin	1(12.5)	0(0)	0(0)	1(100)	0(0)	2(40)
Meropenem	0(0)	0(0)	0(0)	0(0)	1(100)	1(14.29)
Imipenem	0(0)	0(0)	0(0)	0(0)	1(100)	1(12.50)

Therapeutic aspects

Probabilistic antibiotic therapy was started in 182 patients (99.45%) and readapted secondary to susceptibility testing in 14 (7.65%).

Antibiotic therapy was inappropriate in 73.08% of cases, characterized by inappropriate monotherapy (47.37%) and inappropriate use of third-generation cephalosporins (69.23%) (Table 5).

Evolutionary aspects

The outcome was favorable in 115 patients (62.84%); 10 patients died (5.46%) and 49 (26.78%) were discharged against medical advice. Complications occurred in 9 patients (4.92%). The median hospital stay was 7 days, with extremes of 1 day and 21 days.

Discussion

The aim of this study was to investigate the diagnostic, therapeutic and evolutionary aspects of urinary tract infections in hospitals.

Frequency of urinary tract infection and general characteristics of affected patients

From January 1st 2013 to December 31st 2022, a urinary tract infection was diagnosed in 6.36% of patients hospitalized in the internal medicine department of the (DTH-BA) in Parakou. This frequency is higher than that found by Doucouré D, et al. [7] in the infectious diseases department of the CHU de Point G in Mali in 2020, who found a frequency of 4.30%, but lower than that found among pregnant women in Nord-Bénin in 2022, which was 9.9% [8]. The low frequency of urinary tract infections found in our study could also be explained by the fact that urinary tract infection was not systematically investigated in all patients hospitalized during the study period.

In women, UTIs are more frequent at the start of sexual activity and post-menopause, while in men, the frequency increases after mid-life. The average age of patients therefore varies from one study to another. Sometimes it was around 40 [9,10] sometimes 59 [11] or even 73 [12]. This could be explained by the diversity of the populations involved in the various studies. A predominance of women was observed in several studies, no doubt due to the anatomical and physiological predispositions of the female sex [13].

Diagnostic aspects

The symptoms presented by patients with a UTI do not vary from one study to another, but there are variations in their frequency. Several factors influence the clinical expression of a UTI, including age, time to consultation and previous treatments. In the present study, fever, asthenia and urinary burning were the predominant symptoms. In Morocco, dysuria was found in 36.4% of patients [14]. In Mali in 2021, it was mainly dysuria and pollakiuria [15]. However, another study still reported 64.3% asymptomatic patients in Mali in 2019 [16]. It should be noted that the two main signs of pyelonephritis are fever and back pain [17].

In the presence of symptoms suggesting UTI, a urine dipstick should be performed systematically. It has a good negative predictive value in women and a good positive predictive value in men. In a large number of cases, it is the only means of retaining the diagnosis of UTI. Its positivity exceeds 90% in several studies [18-20]. This can be explained by the fact that the urine dipstick is an inexpensive, highly accessible and easy-to-perform test, providing a clear indication of the diagnosis.

The frequency and names of the various urinary tract disorders vary from study to study [21]. While the frequency of pyelonephritis was 38.80% in Parakou, its incidence was 19.2/10,000 in France in 2019 [22].

Among the enterobacteriaceae isolated, E. coli is still at the top of the list, accounting for 47.8% of pregnant women in Ethiopia in 2020 [23] 63% in Japanese children by 2021 [24] and 55.6% in Libya in 2016 [25]. In Benin, E. coli prevalence was 68.4% in Atacora among pregnant women in 2022 [8], but lower (31.07%) in southern Benin in 2023 [9]. It was also 36.07% in a retrospective study from 2003 to 2012 at Mènontin hospital in southern Benin [26]. E. coli is a germ of the intestinal flora and can easily migrate from the intestine to the urinary tract. Added to this is its ability to adhere, enabling it to resist the flow of urine.

With regard to antibiotic susceptibility testing, the resistance profile of isolated germs varies from one study to another, but an increase in resistance is evident in all these studies [9,27,28]. Differences in antibiotic susceptibility profiles from one study to another could be explained by differences in bacterial ecologies and the highly variable conditions under which antibiotics are used. Added to this is the lack of regulation and control of the antibiotic distribution circuit in several contexts.

Table 5. Antibiotics prescribed and assessment of prescription quality.

		Probabilistic Antibiotic Therapy (N=182)		Documented Antibiotic Therapy (N=15)	
		Numbers	%	Numbers	%
Antibiotics Used	Ceftriaxone	126	69.23	3	**20**
	Ciprofloxacin	30	16.48	2	13.33
	Ofloxacin	29	15.93	5	33.33
	Metronidazole	26	14.28	-	-
	Amoxicillin + clav. acid	12	6.59	1	6.67
	Gentamicin	11	6.04	1	6.67
	Cefixime	5	2.75	1	6.67
	Cotrimoxazole	3	1.65	-	-
	Erythromycin	2	1.10	1	6.67
	Cefotaxime	1	0.55	-	-
	Fosfomycin	-	-	1	6.67
	Imipenem	-	-	1	6.67
Correct Dose	Yes	215	87.76	13	81.25
	No	27	11.02	3	18.75
	Unspecified	3	1.22	-	-
Correct Duration	Yes	113	46.12	9	56.25
	No	120	48.98	7	43.75
	Unspecified	12	4.90	-	-
Appropriate Choice of antibiotics	Yes	165	67.35	16	100
	No	80	32.65	-	-
Assessment of Antibiotic Therapy	Correct	49	26.92	11	73.33
	Incorrect	133	73.08	4	26.67
Reasons for Misjudgment	Inappropriate monotherapy	63	47.37	2	50
	Unjustified association	25	18.80	-	-
	Unsuitable association	23	17.29	-	-
	Inadequate antibiotic therapy	22	16.54	2	50

Clav. Acid: Clavulanic Acid

Therapeutic aspects

In the present study, 99.45% of patients received probabilistic antibiotic therapy and only 8.20% of patients received documented antibiotic therapy. While it's easy to admit that in hospitalized patients, it might be difficult to defer antibiotic therapy when it's necessary, it's still incomprehensible that this treatment remains empirical from start to finish in over 90% of cases. This is the real problem identified in this study. Clearly, long-term maintenance of broad-spectrum antibiotic therapy contributes to the selection of multi-resistant germs. Two factors obviously contribute to the low rate of requests for ECBU. The first is the absence of health insurance for most patients, who have to meet their own healthcare costs. The second is the tendency of health-care providers to stop requesting these examinations in the face of frequent patient refusals.

In the study, 73.08% of cases were incorrectly managed with probabilistic antibiotic therapy, the main reason being inappropriate monotherapy (47.37%), taking into account international recommendations for the type of UTI. This demonstrates the need for a strict protocol, known and respected by all, to avoid inappropriate use of antibiotics.

The second shortcoming is the absence of a formally developed and adopted therapeutic protocol for this infection in the department. This is the main cause of inappropriate prescriptions. The over-prescription of 3rd generation cephalosporins, notably ceftriaxone and fluoroquinolones, noted in several studies [29,30], is simply a consequence of the absence of germ susceptibility studies.

Evolutionary aspects

In this study, progression was favorable in 62.84% of cases and death occurred in 5.46%. However, the rate of unfavorable outcomes is very high if we take into account the 26.78% of patients discharged against medical advice. This phenomenon is very frequent in our context. Most of the time, the decision to discharge against medical advice is taken when the parents can no longer afford to continue the care and especially when they do not see a favorable evolution after several days of expenses. We can imagine that they resort to traditional African medicine, but in the majority of cases, patients die a few hours after discharge. The absence or delay of favorable evolution may be the consequence of inappropriate or unsuitable treatment.

Conclusion

This study showed that the diagnosis of urinary tract infections in this context is based on clinical signs and the urine dipstick. Cytobacteriological examinations of urine are rare, which justifies the empirical prescription of a large number of antibiotics. No consensus has been reached on a protocol for the management of these infections, resulting in the inappropriate prescription of antibiotics in the majority of cases. There is therefore an urgent need to draw up a therapeutic protocol for urinary tract infections and to train nursing staff in the proper use of antibiotics.

Author's Contribution

Fiogbé Eudoxie developed the research protocol, conducted the data collection and participated in writing the first draft of the article. Attinsounon Cossi Angelo coordinated the drafting of the protocol, supervised data collection and wrote the first draft of the article. Dovonou Comlan Albert, Alassani Adébayo, Saké khadidjath, Adé Sènan Serge and Adoukonou Thierry reviewed the article.

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Ethics Approval

The research protocol has also been approved by the research protocol to the local biomedical research ethics committee (CLERB) of the University of Parakou. All data from this survey were treated anonymously and with strict confidentiality.

Competing Interests

The authors declare that there are no competing interests.

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