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Epidemiological, Clinical, Bacteriological Profile of Urinary Tract Infection in the Internal Medicine Unit of the Fousseyni Daou Hospital in Kayes

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Abstract

Introduction: Urinary tract infection is one of the most frequent public health problems in the world and concerns all ages. **Objective:** To describe the epidemiological, clinical and biological profile of urinary tract infection in the internal medicine unit of the Fousseyni Daou hospital in Kayes. **Methodology:** It was a descriptive and cross-sectional study with retrospective data collection which took place from January 1 to December 31, 2020 at the Internal Medicine Unit of the Fousseyni Daou Hospital in Kayes. It covered all outpatients and hospitalized patients presenting with a urinary tract infection during the study period. **Results:** We identified 79 cases of urinary tract infection out of 145 requests for ECBU, that is a positivity rate of 53.10% and out of a total of 1883 admissions that is a hospital prevalence of 4.19%. The age groups of 36 to 45 years and 46 to 55 years were more represented in 28 cases (35.44%) and 25 cases (31.64%) with an average age of 45 years ± 10. The female sex was predominant, 42 cases (53.16%) with a sex ratio of 0.88. Housewives were more represented 28 cases (34.44%). The majority of patients resided in rural areas 49 cases (62.03%). The history was dominated by the following pathologies: hypertension 48.10%, diabetes 36.70% and gastropathy 30.37%. The main clinical manifestations were: Urinary burning 67

cases (84.81%), Dysuria 65 cases (82.27%), Pelvic pain 59 cases (74.68%), Fever 57 cases (72.15%). The epidemiological profile of the isolated strains was dominated by enterobacteriaceae, followed by gram-positive cocci and gram-negative bacilli. The main bacteria responsible for urinary tract infections in order of frequency: *Escherichia coli* (45.56%), *Klebsiella pneumoniae* (11.39%), *Pseudomonas aeruginosa* (8.86%), *Staphylococcus aureus* (7.59%), *Streptococcus sp* (6.33%), *Enterobacter cloacae* (3.79%), *Acinetobacter sp* (3.79%). The study of the susceptibility and resistance profiles of the isolated strains showed significant sensitivity of enterobacteriaceae to colistin and resistance to amoxicillin and to the amoxicillin + clavulanic acid combination. **Conclusion:** Urinary tract infections are a major public health problem since they are responsible for significant morbidity and mortality and a high cost of care. Knowledge of the epidemiological-clinical and bacteriological profile of these infections is essential for efficient management.

Keywords

Urinary Tract Infection, Epidemiology, Clinic, Bacteriology, Internal Medicine, Fousseyni Daou Hospital, Kayes, Mali

1. Introduction

Urinary tract infection (UI) is one of the most frequent bacterial infections and constitutes a major public health problem [1]. Urinary tract infections are common in both community and hospital settings. The frequency of urinary tract infections is estimated at 150 million cases per year worldwide [2]. They represent the second site of community bacterial infection after the respiratory tract and the first site of nosocomial infections [2].

Symptoms and clinical signs consistent with a urinary tract infection can be diversified, ranging from functional urinary signs such as pollakiuria or urinary burning, to non-specific symptoms such as fever, chills, malaise, psychomotor slowing, confusion in the elderly [3].

The diagnosis is based on the cytobacteriological examination of the urine which imposes rigorous conditions for sampling, storage, production and interpretation [3].

The treatment is essentially based on the administration of antibiotics either probabilistically according to epidemiological data, or guided by the results of the cytobacteriological examination of the urine. Nevertheless, the known failures with probabilistic treatment are becoming increasingly worrying [4]. The emergence and spread of resistance pose a major public health problem, the control of which is a challenge for clinicians, microbiologists, hygienists and health authorities [5].

The identification of the germs involved and the study of their sensitivity to antibiotics constitute the basis of any effective therapy [4] [5].

We found no work relating to the epidemiological, clinical and bacteriological profile of urinary tract infection in the internal medicine unit of the Fousseyni Daou hospital in Kayes.

Thus, we carried out this work in order to describe these different aspects to contribute to the improvement of the management of urinary tract infection.

2. Methodology

It was a descriptive study with retrospective data collection which took place from January 1 to December 31, 2020 at the Internal Medicine Unit of the Fousseyni Daou Hospital in Kayes. Were included: all outpatients and hospitalized patients during the period of our study and presenting a positive cytobacteriological examination of urine (ECBU). Were excluded from the study: patients who did not have a cytobacteriological examination of the urine (ECBU) or who performed the ECBU with a negative result.

The diagnosis of urinary tract infection was retained in view of the combination of clinical and paraclinical arguments including:

- Presence or absence of signs of urinary tract involvement (dysuria, pollakiuria, urinary burning, hematuria, suprapubic, uni or bilateral lumbar pain, prostatorrhea, fever, nausea, vomiting).
- And when the cytobacteriological examination of the urine (ECBU) shows:

1) A bacteriuria at least equal to 100,000 germs/ml.

2) Leucocyturia at least equal to 10,000/ml.

The data was collected on pre-established survey sheets, entered in Microsoft Word 2007 and Excel 2013 and analyzed using Epi Info 7.2.2.6 software.

Information collected from patient records was completely confidential and used for research purposes.

3. Results

We had identified 79 cases of urinary tract infection out of a total of 1883 admissions (outpatient and hospitalized consultants) that is a hospital prevalence of 4.19% following 145 requests for cytobacteriological examinations of urine (ECBU) that is a positivity rate of 54.48% (74/145) (see **Figure 1**). Among the 79 cases, 67.08% (53/79) were outpatients and 32.91% (26/79) were hospitalized (see **Figure 2**).

The age groups of 36 to 45 years and 46 to 55 years were more represented in 28 cases (35.44%) and 25 cases (31.64%) (see **Figure 3**) with an average age of 45 years ±10.

The female sex predominated in 42 cases (53.16%) with a sex ratio of 1.13 (see **Figure 4**).

Housewives were the largest professional group with 28 cases (35.44%) (see **Table 1**).

Hypertension, diabetes and gastropathy were the most common antecedents found in 38 cases (48.10%), 29 cases (36.70%) and 24 cases (30.37%) respectively

Table 1. Distribution of patients by profession.

Occupation	Effective	Percentage
Household	28	35.44
Farmer	18	22.78
Trader	9	11.39
Shepherd	7	8.86
Saleswoman	10	12.66
Worker	4	5.06
Official	2	2.53
Teacher	1	1.26
Total	**79**	**100**

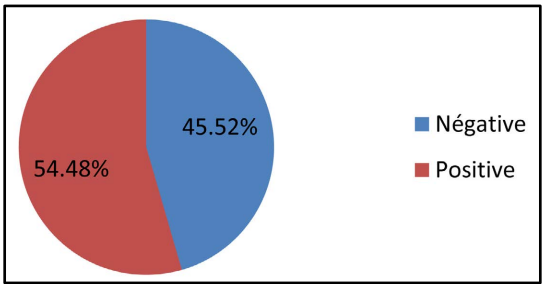

Figure 1. Distribution of ECBUs analyzed during our study period.

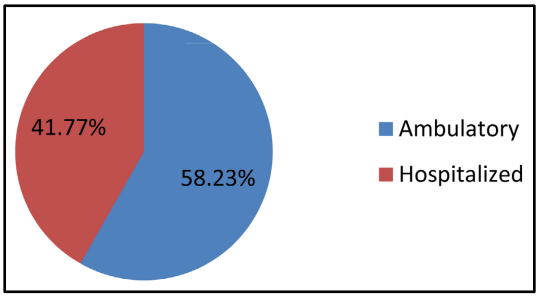

Figure 2. Distribution of patients according to origin.

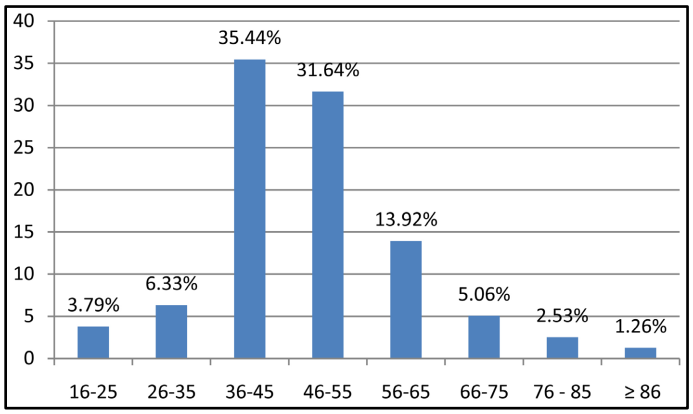

Figure 3. Distribution of patients according to age.

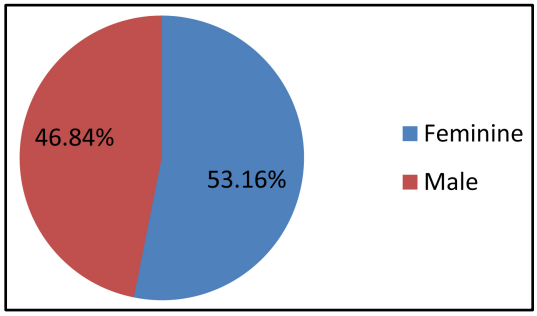

Figure 4. Distribution of patients by gender.

(see **Table 2**).

The main clinical manifestations were: Urinary burns 67 cases (84.81%), Dysuria 65 cases (82.27%), Pelvic pain 59 cases (74.68%), Fever 57 cases (72.15%), (Cf **Table 3**).

The families of bacteria responsible for urinary tract infection were dominated by Enterobacteriaceae 58 cases (73.41%) followed by Gram-positive Cocci 13 cases (16.45%) and Gram-negative Bacilli 8 cases (10.12%) (See **Table 4**).

The main bacteria responsible for urinary tract infections in order of frequency: *Escherichia coli* 36 cases (45.56%), *Klebsiella pneumoniae* 9 cases (11.39%), *Pseudomonas aeruginosa* 7 cases (8.86%), *Staphylococcus aureus* 6 cases (7.59%), *Streptococcus sp* 5 cases (6.33%) *Enterobacter cloacae* 3 cases (3.79%), *Acinetobacter sp* 3 cases (3.79%) (See **Table 5**).

Sensitivity to imipenem, colistin amikacin is constant in *Escherichia coli*, *Klebsiella pneumonaie* and *Pseudomonas aeruginosa* (See **Table 6**).

4. Discussion

4.1. Epidemiological and Clinical Aspect

In our series, we found an overall prevalence of 4.19%. Sah dit Baba C [6] had found a prevalence of 53.62% in 2010 in patients hospitalized in the nephrology department of Point G hospital. Mariam T. [7] in a study on urinary tract infections in the department of urology at the Pr Bocar Sidy Sall University Hospital in Kati found a hospital frequency of 18.16% in 2021 in patients received in consultation and hospitalized. Sanogo D. [8] reported a prevalence of 25.1% in a study on urinary tract infection in consultation at the Point G urology department.

In our study, the ECBU positivity rate was 54.48%. Sah said Baba C [6] had found 53.62%. Raouia O. [9] had found 14%. For Ilyass Es-Saoudy [10] the positivity rate was 13%. Kaim N. and Kouache H. [11] reported 70 positive ECBU out of 245 samples, that is 28.57%. According to Hailaji N.S.M [12]; Yacine Amet Dia [13]; and Smaouia, K *et al.* [14], ECBU positivity rates were respectively 18.4% in Nouakchott; 11.68% in Dakar and 13% in Sfax.

In our series, urinary tract infection was common in ambulatory patients 58.23% against 41.77% in hospitalized patients. Raouia O. [9] found 17.1% in

Table 2. Distribution of patients according to history.

Medical background	Effective (n = 79)	Percentage
High blood pressure	38	48.10
Diabetes	29	36.70
Gastropathy	24	30.37
HIV	7	8.86
Chronic renal failure	7	8.86
Heart failure	4	5.06
Taste	4	5.06
Asthma	3	3.79
Autoimmune disease	2	2.53
Cirrhosis	1	1.26
Prostate adenoma	2	2.53
Stroke	3	3.79
Hyperthyroidism	1	1.26
Operated inguinal hernia	7	8.86
Operated cataract	11	13.92
Operated hemorrhoid	4	5.06
No history	23	29.11

Table 3. Distribution of patients according to clinical signs.

Clinical signs	Effective (n = 79)	Percentage
Urinary burns	67	84.81
Dysuria	65	82.27
Pelvic pain	59	74.68
Pollakiuria	38	48.10
Lower back pain	34	43.03
Hematuria	6	7.59
Cloudy urine	11	13.92
Pyuria	5	6.32
Prostatorrhea	9	11.39
Incontinence	15	18.98
Fever	57	72.15
Chills	23	29.11
Confusion	4	5.06
Vomiting	5	6.32
Alteration of general condition	18	22.78

Table 4. Distribution of patients according to family and bacterium.

Family	Bacteria	Effective	Percentage
Enterobacteriaceae 58 (73.41%)	*Escherichia coli*	36	62.06
	Klebsiella pneumoniae	9	15.51
	Entérobacter cloacae	3	5.17
	Acinetobacter sp	3	5.17
	Proteus mirabilis	2	3.44
	Morganella morganii	1	1.72
	Serratia marcescens	1	1.72
	Serratia plymuthica	1	1.72
	Citrobacter freundi	1	1.72
	Citrobacter koseri	1	1.72
	Total	**58**	**100**
Gram-negative bacilli 8 (10.12%)	*Pseudomonas aeruginosa*	5	62.5
	Acinetobacter baumannii	3	37.5
	Total	**8**	**100**
Gram-positive cocci 13 (16.45%)	*Enterococcus faecalis*	2	15.38
	Streptococcus Sp	5	38.46
	Staphylococcus à coagulase négatif	6	46.15
	Total	**13**	**100**
TOTAL		**79**	**100**

Table 5. Distribution of patients according to germs isolated and origin.

Germs isolated	Origin		Total (n=)	Percentage
	Ambulatory	Hospitalization		
Escherichia coli	**22**	**14**	**36**	**45.56**
Klebsiella pneumoniae	**5**	**4**	**9**	**11.39**
Entérobacter cloacae	1	2	3	3.79
Acinetobacter sp	2	1	3	3.79
Proteus mirabilis	0	1	2	2.53
Morganella morganii	1	0	1	1.26
Serratia marcescens	1	0	1	1.26
Serratia plymuthica	1	0	1	1.26
Citrobacter freundi	1	0	1	1.26
Citrobacter koseri	1	0	1	1.26
Pseudomonas aeruginosa	**3**	**4**	**7**	**8.86**
Acinetobacter baumannii	1	0	1	1.26
Enterococcus faecalis	0	2	2	2.53
Streptococcus sp	**2**	**3**	**5**	**6.33**
Staphylococcus aueus	**4**	**2**	**6**	**7.59**
Total	**45**	**33**	**79**	**100**

Table 6. Distribution of patients according to sensitivity to antibiotics of isolated bacteria.

Antibiotics	Bacteria				
	Escherichia coli (n = 36)	*Klebsiella pneumoniae* (n = 9)	*Pseudomonas aeruginosa* (n = 7)	*Staphylococcus* (n = 6)	*Streptococcus sp* (n = 5)
Amoxicillin	0 (0%)	0 (0%)	0 (0%)	1 (20%)	2 (40%)
Amoxicillin + *A. clavulanic*	4 (11.11%)	2 (22.22%)	2 (28.57%)	2 (33.33%)	**4 (80%)**
Cefalotin	11(30.55%)	6 (66.66%)	-	-	-
Cefotaxime	17 (47.22%)	7 (77.77%)	**7 (100%)**	-	-
Ceftazidim	23 (63.88%)	7 (77.77%)	**7 (100%)**	-	**5 (100%)**
Cefoxitin	24 (66.66%)	7 (77.77%)	-	4 (66.66%)	**5 (100%)**
Imipenem	**34 (94.44%)**	**8 (88.88%)**	**7 (100%)**	-	3 (60%)
Gentamicin	26 (72.22%	3 (33.33%)	2 (28.57%)	2 (33.33%)	2 (40%)
Amikacin	**31 (86.11%)**	**8 (88.88%)**	5 (71.42%)	3 (50%)	1 (20%)
A. nalidixic	5 (13.88%)	3 (33.33%)	0 (0%)	-	2 (40%)
Ciprofloxacin	25 (69.44%)	6 (66.66%)	2 (28.57%)	4(66.66%)	**4 (80%)**
Chloramphenicol	19 (52.77%)	4 (44.44%)	-	5 (**83.33**%)	-
Doxycycline	8 (22.22%)	3 (33.33%)	2 (28.57%)	5 (**83.33**%)	2 (40%)
Colistin	**33 (91.66%)**	**9 (100%)**	**7 (100%)**	-	**5 (100%)**
Trimethoprim Sulfamethoxazole	9 (25%)	0 (0%)	-	3 (50%)	-
Fosfomicin	-	-	-	**6 (100%)**	

hospitalized patients and 82.9% in outpatients. Hailaji N.S.M [12] reported 17.8% in hospitalized patients and 60.8% in outpatients. In the work of Nezha R. [15] this rate was 39.2% in hospitalized patients and 60.8% in outpatients.

The age groups of 36 to 45 years and 46 to 55 years were more represented, that is 35.44% and 31.64%. For Sah dit Baba C [6] the urinary tract infection was not related to age but patients aged 60 and over were the most affected with a frequency of 69.23%. In the study by Mariam T. [7], the age group most affected was that of 61 to 80 years that is 59%. Kaim N. and Kouache H. [11] found that patients aged over 60 were more represented with a percentage of 25.71%.

The average age of our patients was 41 years ± 9. Sah dit Baba C [6] had found the average age to be 43.79 years. Mariam T. [7] found a mean age of 65.80 years, and a standard deviation of 7.08.

The female sex was predominant 53.16%. Sah dit Baba C [6] found that urinary tract infection was more common in women than in men 51.35% against 48.65%. Raouia O. [9] found 50.2% women and 49.8% men with a sex ratio $\simeq 1$. Mariam T. [7] reported a predominance of the male sex with 96.2% against 3.8% for women and a sex ratio of 25.31. Ilyass Es-Saoudy [10] identified 52% female

patients and 48% male patients, that is a Sex-ratio F/M = 1.1. Nezha R. [15] reported 57.4% female patients and 42.6% male patients, that is a sex-ratio F/M = 1.3.

Housewives were the largest professional group 35.44%. According to Sah dit Baba C [6] housewives were the most affected socio-professional stratum with a frequency of 83.33%. For Mariam T. [7] urinary tract infection affects, in order of frequency, farmers that is 47.6%, workers that is 21.0%, civil servants that is 16.19%, traders that is 5.7% and others 7.6%.

In our study, the history was dominated by the following pathologies: hypertension 48.10%, diabetes 36.70% and gastropathy 30.37%. Sah dit Baba C [6] reported as medical history were in order of frequency: hypertension (59.50%), episodes of constipation (31.50%), schistosomiasis (27%). According to Mariam T. [7] the medical history was hypertension in 28.6% and diabetes 5.7%.

The main functional signs of anemia were micturition burning found in 84.81%, dysuria 82.27%, suprapubic pain 74.68%, fever 72.15%. Sah dit Baba C [6] had found: micturition burning (50.5%), pollakiuria (37.8%), lumbar pain (14.4%), dysuria (13.5%) and pain suprapubic (6.7%) were the main manifestations of symptomatic urinary tract infection. The general signs were dominated by: anorexia (73%), nausea (62%), vomiting (51.4%), fever (22.5%). In the study by Mariam T. [7] the symptoms were, in order of frequency were dysuria 81%; urinary burns 71.4%, polyuria 5.7% and terminal hematuria 3.8%.

4.2. Bacteriological Profile

4.2.1. Main Pathogens

The profile of the germs isolated in our study shows a clear predominance of enterobacteriaceae, that is 73.41%. At the head of the thread, we find Escherichia coli with a frequency of 62.06% followed by *Klebsiella spp* with a frequency of 15.51%, *Enterobacter cloacae* 5.17% and *Acinobacter sp* 5.17%.

Sah dit Baba C [6] had found, in order of frequency, gram-negative bacilli: 64%, gram-positive cocci: 29%, yeasts: 5.4%, gram-negative cocci: 4.5%. In the same study, urine culture had made it possible to isolate the majority in order of frequency: Escherichia coli and *Klebsiella pneumoniae* in 57.75% and 22.54% of gram-negative bacilli; a codominance of *Staphylococcus aureus* and coagulase-negative *Staphylococus*.

For Mariam T. [7] the most frequently isolated bacterial species were *E. coli*, that is 47.6%, *Staphylococcus aureus*, that is 36.2%, *Klebsiella pneumoniae*, that is 10.5%, *Pseudomonas aeruginosa*, that is 2.9%, *Proteus mirabilis*, that is 1.9% and *Brukholderia cepacia* or 1%.

Raouia O. [9] found 86.3% enterobacteria including *Escherichia coli* 61.2% followed by *Klebsiella spp* 15.6%, *Enterobacter cloacae* 4.7%, *proteus* 2.7%.

Ilyass Es-Saoudy [10] showed a clear predominance of enterobacteriaceae which represented 80% of the isolates. At the head of the thread, he found Escherichia coli with a frequency of 71.2% followed by *Klebsiella spp* with a frequency of 15%, *Enterobacter cloacae* with a rate of around 5%.

Kaim N. and Kouache H. [11] noted that Gram negative was the main category responsible for urinary tract infection with a percentage of (90.90%), it was dominated by Enterobacteriaceae (85.71%) followed by Pseudomonadaceae (5.19%), against (9.09%) Gram-positive bacteria which were represented mainly and only by Staphylococcaceae. The same study found a predominance of *Escherichia coli* with (67.53%) followed by *Klebsiella pneumoniae* (10.39%), *Proteus mirabilis* (7.79%), the other germs (*Pseudomonas sp* and *Staphylococcus aureus*) were present with a percentage of (5.19%), while *Staphylococcus* with negative coagulase was less incriminated with (3.90%).

Hailaji N.S.M; [12] had reported 92.2% of enterobacteria including *Escherichia coli* of 64.4% followed by *Klebsiella spp* 24.1%, *proteus* 2.7%.

Yacine Amet Dia [13] had found 88.20% enterobacteriaceae including *Escherichia coli* 77.84% followed by *Klebsiella spp* 13.90%, *Enterobacter cloacae* 2.34%, *proteus* 2.55%.

Smaouia, K *et al*. [14] found 58.9% *Escherichia coli* and 14.5% *Klebsiella spp*.

In our study, Gram-positive cocci represented 13%, of which 46.15% were *Staphylococci aureus* and 38.46% *Streptococcus sp*.

Raouia O. [9] had found 10% Gram-positive Cocci including 3.6% *Staphylococci aureus* and 3.2% *Streptococcus sp*.

For Ilyass Es-Saoudy [10] Gram-positive cocci accounted for 15% of isolates, of which 32% were *Streptococcus agalactiae* and 21% *Staphylococci aureus* and 20% coagulase-negative *Staphylococcus* and 19% enterococci.

Hailaji N.S.M; [12] had reported 6% Gram-positive cocci including 5.7% *Staphylococci aureus*.

Yacine Amet Dia [13] had found 8.13% of Gram-positive Cocci including 63.15% of Staphylococci aureus and 29.6% of *Streptococcus sp*.

In our series, Gram-negative bacilli represented 5%, including 65% *Pseudomonas aeruginosa* and 62.5% *Acinetobacter baumani* 37.5%.

Raouia O. [9] found that Gram-negative bacilli represented 3.7%, including 2.5% *Pseudomonas aeruginosa* and 1.2% *Acinetobacter baumani*.

For Ilyass Es-Saoudy [10] non-fermenting Gram-negative bacilli accounted for 5%, including 65% *Pseudomonas aeruginosa* and 35% *Acinetobacter baumani*.

Hailaji N.S.M; [12] reported 1.8% Gram-negative bacilli including 1.6% *Pseudomonas aeruginosa* and 0.2% *Acinetobacter baumani*.

Yacine Amet Dia [13] found 8.13% Gram-negative bacilli including 73.86% *Pseudomonas aeruginosa* and 11.11% *Acinetobacter baumani*.

4.2.2. Sensitivity to Antibiotics of the Main Germs Isolated

1) *Escherichia coli*:

In our study, *Escherichia coli* was resistant to amoxicillin (81.81%); amoxicillin + clavulanic acid (45.45%).

Raouia O. [9] observed that *Escherichia coli* has a high resistance rate 65.3% for Ampicillin/Amoxicillin, 43.5% amoxicillin + clavulanic acid.

For Ilyass Es-Saoudy [10] noted 68% of strains resistant to ampicillin and 51% for amoxicillin + clavulanic acid.

Hailaji N.S.M; [12] reported 82.1% resistance for Ampicillin/Amoxicillin and 28.2% for amoxicillin + clavulanic acid.

For Yacine Amet Dia [13] there was 71.78% resistance for Ampicillin/Amoxicillin and 46.5% for amoxicillin + clavulanic acid.

Our study showed the strains isolated from *Escherichia coli* were more sensitive to imipenem, colistin and amikacin respectively 94.44%, 91.66% and 86.11%).

According to Raouia O. [9] the active antibiotics on *Escherichia coli* were: colistin 100%, imipenem 99%, amikacin 97.1%, Nitrofurantoine 96.9%.

For Ilyass Es-Saoudy [10] the aminoglycosides kept a good activity mainly amikacin and to a lesser degree gentamicin reaching respectively 99% and 85.9% sensitivity to *Escherichia coli*.

Hailaji N.S.M; [12] reported sensitivity of *Escherichia coli* for imipenem 99%.

Yacine Amet Dia [13] had found a sensitivity of 94.86% for *Escherichia coli*.

Smaouia, K *et al*. [14] reported a sensitivity of *Escherichia coli* of 100% to Fosfomycin, 99% for Nitrofurantoin, 98.9% for amikacin and 96.3% for Gentamicin.

Traore *et al*. [16] had reported in a study in 2012 an *Escherichia coli* sensitivity of 89%; amikacin, colistin and doxycycline at 88.2% each.

Through our work, we noticed that our strains of *Escherichia coli* were more resistant to beta-lactams and also showed decreased susceptibility to gentamicin, nalidixic acid, ciprofloxacin and cotrimoxazole.

2) *Klebsiella pneumoniae*:

In our work, strains of *Klebsiella pneumoniae* were sensitive to the following antibiotics: colistin 100%, imipenem 88.88%, amikacin 88.88%.

According to Raouia O. [9] the active antibiotics against *Klebsiella pneumoniae* were: colistin 100%, imipenem 97.5%, amikacin 97.3%.

For Ilyass Es-Saoudy [10] amikacin was 98% more active on *Klebsiella pneumoniae*.

Hailaji N.S.M; [12] reported sensitivity of *Klebsiella pneumoniae* for imipenem 100% and colistin 98.2%.

Smaouia, K *et al*. [14] reported a sensitivity of *Klebsiella pneumoniae* of 97% for amikacin and 95.1% for fosfomycin.

Traore *et al*. [17] had reported a sensitivity of *Klebsiella pneumoniae* to colistin of 94.1%; cefoxitin 81.3%; amikacin 78.6%.

On the other hand, our study found that the strains were resistant: amoxicillin 100%; amoxicillin + clavulanic acid 66.66%; to gentamicin 33.33; to ciprofloxacin 33.33%.

Traoré *et al*. found 100% resistance to ciprofloxacin.

3) *Pseudomonas aeruginosa*:

The results of our study showed that strains of *Pseudomonas aeruginosa* were sensitive to imipenem 100%, amikacin 100% and colistin 100%.

According to Raouia O. [9] antibiotics active on *Pseudomonas aeruginosa* were: colistin 100% and imipenem 97.7%.

For Ilyass Es-Saoudy [10] amikacin and gentamicin were more active on *Pseudomonas aeruginosa* respectively 90% and 90%.

4) *Staphylococci aureus*:

Our strains of *Staphylococcus aureus* were sensitive to Fosfomicin 100%, chloramphenicol 83.33%, doxycycline 83.33%.

They were resistant to amoxicillin, amoxicillin/clanulanic acid, gentamicin.

According to Raouia O. [9] antibiotics active on *Staphylococci aureus* were: vancomicin 100%, Trimethoprim + Sulfamethoxazole 91.7%, Rifampicin 90.9, Ciprofloxacin 90% Erythromycin 89.5%.

For Ilyass Es-Saoudy [10] antibiotics active on *Staphylococci aureus* were: Vancomicyne 100%, Ticarcillin/ac clavulanic 100%, Fosfomycin 91%, cotrimoxazole 90%, Cefotaxime 88%.

Kaim N. and Kouache H. [11] had reported sensitivity of *Staphylococci aureus* to Erythromycin 100%, Chloramphenicol, Sulfamethoxazole + Trimethoprine, Spiramycin, Fosfomycin 96.29%, Ciprofloxacin 92.59%.

Hailaji N.S.M; [12] reported a sensitivity of *Staphylococci aureus* for Gentamicin 92.9%, Erytromicin and Ciprofloxacin for respectively 89.3% each.

Yacine Amet Dia [13] had found a sensitivity of Vancomicine 92.14%, Gentamicine 94.86, rifampicine 90.6% on *Staphylococci aureus*.

5) *Streptococcus Sp*:

Our strains of Streptococcus sp were sensitive to colistin 100%, ceftazidime 100%, cefoxitin 100%, amoxicillin + clavulanic acid 80%.

Toutou S. [18] in 2006 reported sensitivity to amoxicillin at 74.29%.

In 2003 Sangare *et al*. [19] found an amoxicillin sensitivity of 86%.

5. Conclusion

Urinary tract infection is a public health problem because of the emergence of acquired resistance mechanisms within bacterial species limiting the indication of first-line antibiotics. The monitoring of these resistance mechanisms by antibiogram is necessary to develop national recommendations for the treatment of urinary tract infections in order to standardize their management.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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