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Prevalence of Urinary Tract Infections and Antibiogram in Diabetic Patients Followed in the Democratic Republic of the Congo

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Abstract: Introduction: Urinary tract infection (UTI) is common in diabetic patients in general, but more so in patients who are not well balanced. The objective of our study was to identify the germs responsible for urinary tract infection and to study their sensitivity to the antibiotics used. Method: This was a retrospective and descriptive study of 212 diabetic patients followed at the Hospital du Cinquantenaire in Kinshasa from January 2019 to December 2021. The diagnosis of urinary tract infection was retained in the presence of positive bacteriuria, i.e. bacteriuria of the jet medium ≥ 105 cfu/ml in women and ≥ 104 cfu/ml in men or bacteriuria of urine collected in an indwelling catheter ≥ 102 cfu/ml. Results: Of the 800 diabetics received, 320 had performed a UEC and of these 212 were positive. The mean age of the patients included in our work was 43.1 ± 12.7 years with extremes of 18 and 77 years. The female sex was more represented (58.4%), i.e. a sex ratio of 01.3. Escherichia coli were the most frequent germ in 36.3% of cases, followed by Klebsiella pneumoniae in 28.8%. The resistance rate was 40% for ampicillin, 60% for amoxicillin, 80% for oxacillin, 71.8% for ceftriaxone and 12.5% for imipenem. As for quinolones, the resistance rate was 82.6% for norfloxacin and 74.1% for ciprofloxacin. Resistance to gentamicin was 66.7%. Resistance rates for cotrimoxazole were 77.8% and 25.9% for nitrofurantoin. Conclusion: Urinary tract infection is a frequent pathology in diabetics. The most isolated germ is Escherichia coli. The rate of bacterial resistance was very high and varied from one study to another.

Keywords: Diabetes, Urinary Tract Infection, Escherichia Coli

1. Introduction

Diabetes mellitus is a major public health problem in the world but especially in developing countries because of the diagnostic and therapeutic difficulties [1].

The prevalence of diabetes mellitus is increasing due to the consumption of unhealthy foods, the increase in physical inactivity and the aging of the population [2-4].

Its evolution can be marked by several acute or chronic complications, vascular, metabolic and infectious.

The most frequent infectious disease in diabetic patients is urinary tract infection [5].

It is estimated that 150 million people worldwide suffer from urinary tract infections each year [6].

This urinary tract infection can involve the urethra, kidney or bladder and women are more affected than men due to the

urogenital anatomy [7, 6].

Factors such as white blood cell glucotoxicity, macro and micro angiopathy with hypoperfusion of the urinary tract contribute to urinary tract infections in patients with diabetes [7-10]. The identification of the germ and the antibiogram are necessary for the management. Nowadays, bacterial resistance to antibiotics is becoming a major concern. In the Democratic Republic of Congo, data on UTIs in diabetic patients are non-existent and this study is a first to remedy this deficiency.

2. Methods

Our study took place in the department of internal medicine of the Cinquantenaire Hospital. It was a retrospective and descriptive study of 212 diabetic patients followed at the Hospital du Cinquantenaire of Kinshasa from January 2019 to December 2021. All diabetic patients presenting the symptom of a urinary tract infection and having performed the urine cytobacteriological examination (UCT) were included. Diabetic patients who did not perform the urine cytobacteriological examination were excluded. During the study the following conditions were observed.

All samples were taken before any antibiotic therapy in any patient who presented a suggestive urinary sign or in front of a systematic positive nitrituria or leukocyturia. The samples were preceded by hand hygiene and cleaning of the urethral or vulvar region. The collection method used was the "jet medium" method.

Case definition - The diagnosis of UTI was retained in the presence of positive bacteriuria i.e., jet media bacteriuria ≥ 105 cfu/ml in women ≥ 104 cfu/ml in men or bacteriuria of urine collected in an indwelling catheter ≥ 102 cfu/ml. [11].

3. Results

During the study period, there were 800 diabetic inpatients and outpatients, of whom 320 had performed a UTI. Of the ECBU performed, 212 were positive, i.e. a frequency of urinary tract infection of 66.3%.

General characteristics

The mean age of the patients included in our study was 53.1 ± 15.7 years with extremes of 18 and 75 years. The age range 57 to 68 years was predominant (27.4%). Females were predominant (58.4%), with a sex ratio of 1.3. (Table 1).

Paraclinical aspects Macroscopically, the urine was turbid in 43.4% of cases.

The bacteriological frequency of Escherichia coli, Klebsiella pneumonia, Streptococcus agalactiae and Staphylococcus epidermidis was 36.3%, 28.8%, 19.3% and 13.7% respectively (Table 2).

Concerning antibiotic resistance, the rate of resistance was 40% for ampicillin, 60% for amoxicillin, 80% for oxacillin, 71.8% for ceftriaxone and 12.5% for imipenem. As for quinolones, the resistance rate was 82.6% for norfloxacin and 74.1% for ciprofloxacin. Resistance to gentamicin was 66.7%. Resistance rates for cotrimoxazole were 77.8% and 25.9% for nitrofurantoin (Table 3).

Table 1. *General characteristics of the study population.*

Variables	Numbers (n=212)	(%)
Age		
18-27 years	22	10,4
28-37 ans years	19	9,0
38-47 years	27	12,7
48-57 years	45	21,2
57-68 years	58	27,4
> 68 years	41	19,3
Gender		
Male	93	43,9
Female	119	56,1
Marital status		
Single	62	29,2
Married	107	50,5
Widowed/Divorced	43	20,3
Level of education		
No education	61	28,8
Primary	42	19,8
Secondary	71	33,5
Higher education & university	38	17,9
Socio-economic level		
Low	80	37,7
Moderate	120	66,6
High	12	5,7
Profession		
No profession	58	27,4
Student	45	21,2
Liberal	81	38,2
Civil servant	28	13,2
Aspect des Urines		
troubles	92	43,4
Claire	73	34,4
Mouseuse	47	22,1

Table 2. *Fréquence des germes isolés à l'examen bactériologique des urines chez les patients diabétiques Germes isolés.*

Germe	Fréquence	%
Escherichia Coli	77	36,3
Klebsiella Pneumoniae	61	28,8
Streptococcus Agalactiae	41	19,3
Staphyloccus Epidermidis	29	13,7
Enterobacter Sp	4	1,9
Total	212	100

Table 3. *Répartition selon le comportement des germes vis-à-vis des antibiotiques au cours des infections urinaires chez les patients diabétiques inclus.*

Antibiotiques	Nombre de fois testé	Sensible (%)	Résistant (%)
Ampicilline	40	24 (60%)	16 (40%)
Amoxicilline	15	6 (40%)	9 (60%)
Oxacilline	10	2 (20%)	8 (80%)
Ceftriaxone	39	11 (28,2%)	28 (71,8%)
Imipénème	8	7 (87,5%)	1 (12,5%)
Céfixime	29	9 (31,0%)	20 (69%)
Acide Nalidixique	10	1 (10%)	9 (10%)
Norfloxacine	23	4 (17,4%)	19 (82,6%)
Ofloxacine	10	6 (60%)	4 (40%)
Ciprofloxacine	27	7 (25,9%)	20 (74,1%)
Gentamicine	24	8 (33,3%)	16 (66,7%)
Cotrimoxazole	18	4 (22,2%)	14 (77,8%)
Nitrofurantoin	27	20 (74,1%)	7 (25,9%)

4. Discussion

The prevalence of urinary tract infection in diabetic patients is very high and unevenly distributed across countries. In this study, the prevalence of UTI is 26.5% with a female predominance.

This prevalence is high compared to the world is 10.16%, more than the prevalence reported in Germany, and Sweden. It remains lower than the prevalence of 33.29% reported in the United States [12, 13].

The prevalence of UTI is more frequent in diabetics over 50 years of age. This finding corroborates the Tunisian, Beninese and other studies [14, 15].

This could be explained by the peripheral neuropathy with damage to the bladder responsible for bladder stasis, which can be the cause of microbial proliferation [16].

The female predominance reported in this study corroborates the literature with a statistically significant difference [17, 18]. The most frequently isolated germs were Escherichia coli 36.3% and Klebsiella pneumoniae 28.8%. This distribution of bacterial species during urinary tract infection in diabetics seems to be constant in the literature with a simular prevalence [19, 20].

In our study, the resistance of germs to betalactamines was very high except for imipenem. Our results are in line with studies conducted in other African countries [20, 21].

Indeed, the rates of resistance to ampicillin, amoxicillin, ceftriaxone, Cefixime, Ciprofloxacin, Cotrimoxazole and Nitrofurantoin were respectively 40%, 60%, 71.8%, 69%, 74.1%, 77.8% and 25.9% in their work.

These differences in the sensitivity of germs to antibiotics vary from one study to another for multiple reasons, among others the difference in bacterial ecologies, the conditions of use and quality of antibiotics and the self-medication and illicit sale of drugs can justify a high rate of resistance.

5. Conclusion

Escherichia coli was the most frequently encountered germ in urinary tract infections in diabetic patients. The rate of bacterial resistance was very high for beta-lactam and quinolone antibiotics. These data should be taken into account in any antibiotic therapy for urinary tract infections, especially probabilistic ones.

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