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Epidemiologic and Statistical Study of the Antibiotic Resistance Profile of Enterobacteria in the Community Environment

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Introduction Bacterial resistance to antibiotics is a real public health problem. It is reaching dangerously high levels in all regions of the world. Recently, new resistance mechanisms are emerging and spreading worldwide, leading to complications.
Objective To evaluate the antibiotic resistance profile of bacteria in municipal laboratories, based on an epidemiologic and statistical study.
Materials and Methods This is a prospective statistical study. It was conducted in municipal laboratories in southeast Morocco. Inclusion criteria were positive results. Exclusion criteria were negative results and other microorganisms (viruses, mycoses and parasites). An antibiogram was performed. A data collection form was used to collect data. Data were statistically analyzed with 5% risk.
Results A total of 2,538 specimens were collected, of which 846 were positive. The positivity rate was 33.3%. BGN 738 (87.2%), CGP 96 (11.3%), CGN 12 (1.5%). Female predominance 536 (63%) versus 310 (37%). The F/H sex ratio was 1.7. The age groups studied showed a predominance of [21-40years] with 298 (35.2%). A predominance of urinalysis was found with 648 (76.6%), represented by *Escherichia coli* 390 (66.1%), *Klebsiella pneumoniae* 100 (17%). Enterobacteriaceae showed increased resistance to amoxicillin, while imipenem maintained good susceptibility.
Conclusion The results showed an increase in resistance. Rigorous surveillance and uniform methodology are still needed to limit the emergence of resistant strains.

Keywords Enterobacteriaceae, epidemiology, antibiotic resistance, city laboratory

I. INTRODUCTION

Bacterial resistance to antibiotics is a real public health problem. It is reaching dangerously high levels in all regions of the world. It is a massive and worrying phenomenon. Bacterial resistance to antibiotics can result from either mutations or acquisition of resistance genes that confer resistance to one or more antibiotics. Recently, new resistance mechanisms have emerged and are spreading worldwide, making it difficult to treat common infectious diseases. According to the World Health Organization, antimicrobial resistance leads to increased medical expenditure, longer hospital stays and higher mortality.

II. OBJECTIVE

To conduct an epidemiologic and statistical study to assess the antibiotic resistance profile of bacteria in community laboratories.

III. MATERIALS AND METHODS

This is a prospective descriptive statistical study. It was conducted outside hospitals in urban laboratories in southeastern Morocco. Inclusion criteria were all positive specimens: urine examination, vaginal swab, urethral swab, pus, semen. Exclusion criteria were negative test results and other microorganisms

(viruses, mycoses and parasites). An antibiogram was performed. Data were collected using a data collection form. Data were statistically analyzed at 5% risk.

IV. RESULTS

A total of 2538 specimens were collected, of which 846 were positive. The overall positivity rate was 33.3%. Gram-negative bacilli (BGN) numbered 738 (87.2%), gram-positive cocci (CGP) 96 (11.3%). Gram-negative cocci (CGN) were 12 (1.5%) **Figure 1**. The distribution of positive samples by sex out of a total of 846 showed a predominance of 67% females versus 33% males. The sex ratio F/H ~ 2 in urban laboratories **Figure 2**. The age groups found in this study showed that 182 (21.6%) were in the [0-20] age group, while 146 (17.2%) were in the [41-60] age group and 220 (26%) were in the over-60 age group. Bacterial infections predominated in the [21-40] age group with a total of 298 (35.2%) **Figure 3**. The study showed that urine cytobacteriology was the most commonly requested test in urban laboratories with a predominance of 90.3%, followed by vaginal swabs with 5.5% and spermograms with 2.3% **Figure 4**. Enterobacteriaceae isolated were dominated by *Escherichia coli* 390 (68.9%), *Klebsiella spp* 126 (22.3%), *Proteus mirabilis* 26 (4.6%), *Enterobacter spp* 15 (2.7%), *Providencia spp* 9 (1.6%) **Figure 5a**. Female predominance was observed in urinary tract infections with *Escherichia coli*, *Klebsiella spp* and *Proteus spp*. *Escherichia coli* resistance to AMX increased to 85.4%, to AMC to 38.0% and to SXT to 39.9%. Imipenem retains good susceptibility, **Figure 6a**. *Klebsiella spp* showed resistance to AMC with 49.2% and to SXT with 38.2%. Imipenem retains good susceptibility **Figure 6b**. *Proteus spp* resistance to AMX and AMC increased to 78.3% and 46.2% respectively **Figure 6c**. Imipenem retains good susceptibility to *Enterobacter spp* and *Providencia spp* **Figure 6d,6e**.

V. DISCUSSION

The epidemiologic study was conducted in several medical laboratories in southeastern Morocco. It reflects the situation of different isolate resistances during the period studied. This study shows that bacterial urinary tract infections are very common. In fact, they are the second most common reason for consultation after bronchopulmonary infections [1-2]. A significant difference was found in the gender distribution, with 33% of men versus 67% of women (sex ratio F/H=2.0). Studies conducted in different countries, particularly Iran [3] and USA-Canada [4], reported F/H sex ratios of 5.5% and 3.8%, respectively. The study showed a clear predominance of enterobacteria, represented by *Escherichia coli* 390 (68.9%), followed by *Klebsiella spp* 126 (22.3%). This may be explained by the ascending pathophysiology and the high colonization of the perineum with enterobacteria of digestive origin [5]. A study conducted in France confirmed the predominance of *E. coli* (79.8%) in community urinary tract infections [6]. Another study in Brazil showed that 87.3% of *E. coli* isolated from community urinary tract infections were resistant [7-8]. The betalactam family is particularly affected, especially amoxicillin. The high susceptibility of Enterobacteriaceae is related to 3rd generation cephalosporins and imipenem. A decrease in susceptibility to AMC has been observed. Sensitivity to SXT remains low.

VI. CONCLUSION

The results showed an increase in antibiotic resistance in the different strains of bacteria involved in community infections. Resistance has reached alarming levels. This increase could be related to selection pressure due to the overuse of antibiotics in the medical field and the lack of statistical data on the extrahospital environment. Surveillance remains necessary to limit the emergence of resistant strains. The outlook is based on rigorous surveillance and a uniform methodology, as well as the reporting of multidrug-resistant strains.

Conflict of interest

No conflict of interest.

REFERENCES

[1]. Société de Pathologie Infectieuse de Langue Française, "Antibiothérapie des infections urinaires". Med Mal Infect 1991; 21 : 51-4.

[2]. Chemsi H, Frikh M, Lemnouer A, Belfkih B, Sekhsokh Y, Chadli M, et Elouennass M. Pneumopathie postopératoire à association Haemophilus Influenzae et Neisseria meningitidis chez un enfant diabétique. The pan African medical journal 2016 ; 25:8.

[3]. Kashef K, Djavid G E , Shahbazi S, "Antimicrobial susceptibility patterns of community-acquired uropathogens in Tehran, Iran". The Journal of Infection in Developing Countries 2010; 4:202-6.

[4]. Zhanel G G , Hisanaga T L, Laing N M, DeCorby M R, Nichol K A , Palatnick L P , et al, "Antibiotic resistance in outpatient urinary isolates: final results from the North American Urinary Tract Infection Collaborative Alliance (NAUTICA)". International journal of antimicrobial agents 2005; 26:380-8.

[5]. Janvier J, Mbongo-Kama E, Mérens A, Cavallo J D , "Les difficultés d'interprétation de l'examen cytobactériologique des urines". Revue Francophone des laboratoires 2008; 2008:51-59.

[6]. De Mouy D, Fabre R, Cavallo J D, "Infections urinaires communautaires de la femme de 15 à 65 ans: sensibilité aux antibiotiques d' E. coli en fonction des antécédents: étude AFORCOPI–BIO 2003". Médecine et maladies infectieuses 2007; 37:594-8.

[7]. Teichmann A, de Cunha Agra H N, de Souza Nunes L, da Rocha M P, Renner J D P, Possuelo L G , et al, "Antibiotic resistance and detection of the sul2 gene in urinary isolates of Escherichia coli in patients from Brazil". The Journal of Infection in Developing Countries 2014 8 : 039-43.

[8]. Lobel B, Valot A, Cattoir V, Lemenand O, Gaillot O, "Comparaison de la sensibilité aux antibiotiques de 1 217 isolats consécutifs de Escherichia coli responsables d'infections urinaires féminines en ville et à l'hôpital". La Presse Médicale 2008; 37:746-750.

FIGURES

I. Global distribution of isolates

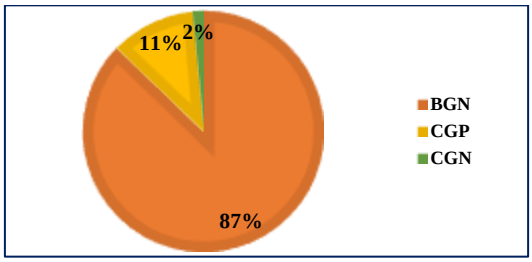

Figure 1 Diagram of global distribution of isolates

II. Distribution of enterobacteria isolates by gender

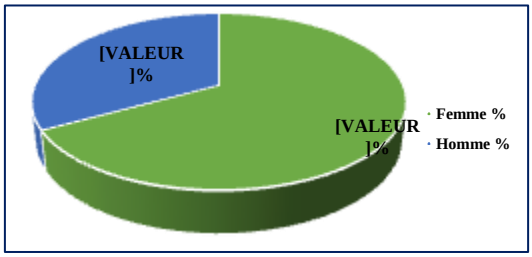

Figure 2 Distribution of Enterobacteriaceae by sex

III. Distribution of isolates by age

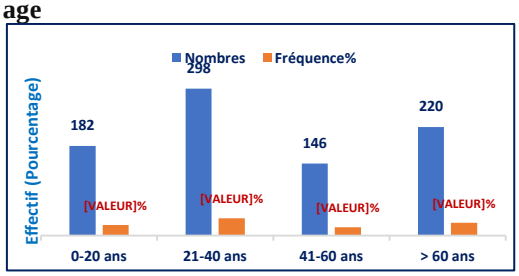

Figure 3 Distribution of isolates by age group

IV. Distribution of Enterobacteriaceae by type of sample

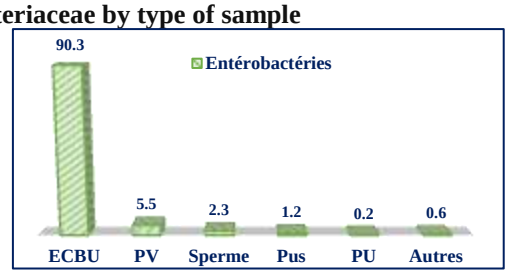

Figure 4 Distribution by type of sample

V. Distribution of isolated Enterobacteriaceae

1. Distribution of isolated Enterobacteriaceae by species

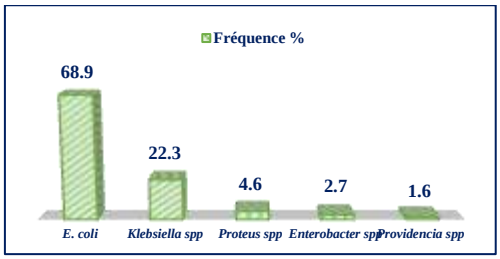

Figure 5a Distribution of isolated Enterobacteriaceae by species

2. Distribution of isolated Enterobacteriaceae by gender

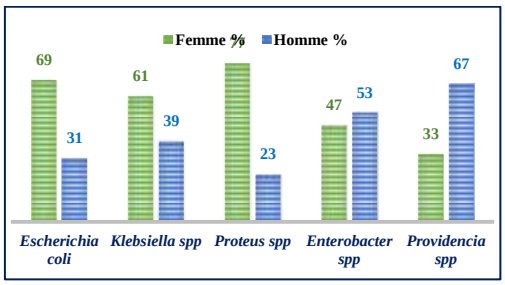

Figure 5b Distribution of isolated Enterobacteriaceae by sex

VI. Resistance profile of isolated Enterobacteriaceae

1. *Escherichia coli* resistance profile

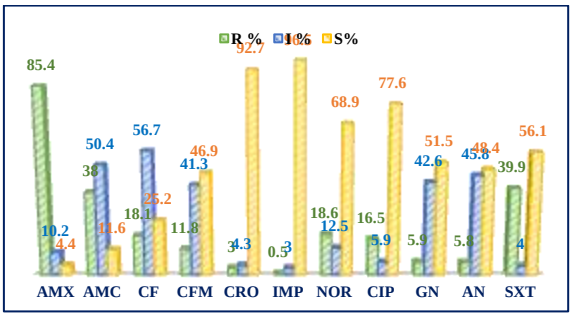

Figure 6a Antibiotic resistance profile of *E.coli*

2. *Klebsiella spp* resistance profile

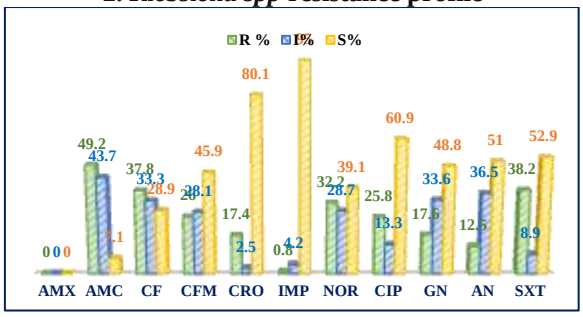

Figure 6b *Klebsiella spp* antibiotic resistance profile

3. Resistance profile of *Proteus mirabilis*

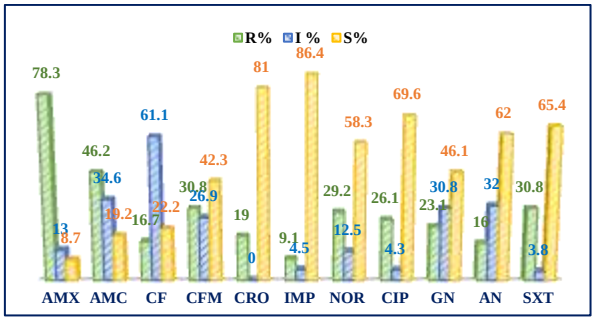

Figure 6c Antibiotic resistance profile of *Proteus mirabilis*

4. *Enterobacter spp* resistance profile

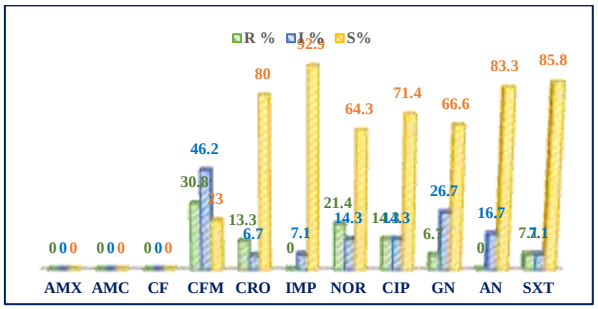

Figure 6d *Enterobacter spp* antibiotic resistance profile

5. Antibiotic resistance profile of Providencia spp

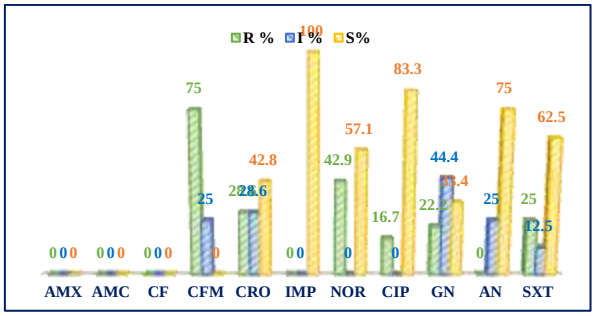

Figure 6e Antibiotic resistance profile of *Providencia spp*

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