ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF RESEARCH IN PHARMACEUTICAL SCIENCES

Published by JK Welfare & Pharmascope Foundation Journal Home Page: www.pharmascope.org/ijrps

Resistance profile of bacteria to antibiotics in an out hospital environment

Hicham Chemsi*, Farida Hilali, Abdelilah Laraqui, Tahar Bajjou, Yassine Sekhsokh

Laboratory of Research and Biosafety, Military Training Hospital Mohamed V (HMIMV), Faculty of Medicine and Pharmacy of Rabat, Mohammed V-Souissi University, Morocco

Article History:

Received on: 27 Feb 2021
Revised on: 01 Apr 2021
Accepted on: 03 Apr 2021

Keywords:

Frequency, Extramural, Sensitivity, Resistance

ABSTRACT

For an increasing number of infections and causative agents, treatment becomes more difficult or impossible because of the loss of antibiotic efficacy. As a result, resistance is a real public health problem. The purpose of this study is to evaluate the frequency of community bacterial infection as well as to establish a susceptibility profile of bacteria isolated from antibiotics. It is a prospective study, descriptive type. It was conducted in a non-hospital setting over a six-month period. The inclusion criteria were all positive specimens: urinary examination, vaginal sampling, urethral sampling, pus, sputum, sperm. Exclusion criteria included patients with negative examinations and other microorganisms (viruses, fungal infections and parasites). The data collection was done using an information sheet. An antibiogram is performed for the study of resistance. Data mining was performed and analyzed statistically. Of 1565 samples that met the inclusion criteria, 1228 strains were Gram-negative bacilli (78.46%), 323 Gram-positive cocci (20.64%), 14 Gram-negative cocci (0.9%). The sex ratio was 2.2. The distribution of isolates showed a predominance of urinary examinations 1076 (68.8%), vaginal samples 195 (12.5%), urethral specimens 111 (7.1%), sputum 105 (6.7%), spermocultures 36 (2.3%), plus 28 (1.8%) and various 14 (0.8%). It was represented by Escherichia coli 986 (63.1%), Klebsiella pneumoniae 235 (15.1%), Staphylococcus sp 106 (6.8%), Enterococcus sp 64 (4.1%), Streptococcus sp 59 (3%). , 8%), Enterobacter sp 39 (2.5%), Pseudomonas sp 28 (1.7%), Proteus sp 25 (1.5%), Neisseria gonorrhoae 13 (0.8%), Citrobacter koseri 8 (0%) , 5%) and Acinetobacter sp 2 (0.1%). The susceptibility frequency of enterobacteria is represented by amoxicillin + clavulanic acid 49.3%, ceftriaxone 97.1%, cefuroxime 89%, cefotaxime 100%, gentamicin 69.6%, ciprofloxacin 75.1% , sulfamethoxazole-trimethoprim 41.1% and doxycycline 29.9%.

*Corresponding Author

Name: Hicham Chemsi
Phone: +212 661064067
Email: chemsi.h2@gmail.com

ISSN: 0975-7538

DOI: https://doi.org/10.26452/ijrps.v12i2.4749

Production and Hosted by

Pharmascope.org

INTRODUCTION

In recent years, bacterial resistance to antibiotics has reached dangerously high levels in all regions of the world. New mechanisms of resistance appear and spread, thus rendering the treatment of infectious diseases ineffective (WHO, 2014). For an increasing number of infections, such as urinary tract infections, pneumonia, tuberculosis and gonorrhea, treatment becomes more difficult or impossible because of the loss of antibiotic efficacy. The World Health Organization has regarded antibiotic

resistance as a serious threat to human health and modern medicine, and it is a public health problem that is emerging exponentially in some countries, according to the same organization. Given the importance of the subject, we were led to undertake this study which aims to assess the frequency of community bacterial infection as well as establish a susceptibility profile of bacteria isolated antibiotics.

MATERIALS AND METHODS

This is a prospective study, descriptive type. It was conducted in a non-hospital environment in a private laboratory for medical, biological analysis in Casablanca. This study was carried out on 1565 positive cytobacteriological samples taken from a population comprising all age categories and sex. It was spread over a 6-month period. The isolation of the different strains was carried out on the various samples: Urinary cytobacteriological examination (UCB), vaginal sampling (VS), pus, sputum, sperms, urethral swabs (US). The exclusion criteria concerned patients with negative examinations and other microorganisms (viruses, mycoses and parasites). Data collection was carried out using a sheet containing the following information (age, sex, nature of sampling, bacterial identification, results and antibiograms). An antibiogram is a test of resistance, prediction, growth and mandatory interpretation, and it is performed on the positive identifications according to the CA-SFM/EUCAST 2019 (Kahlmeter *et al.*, 2006). The data was exploited on Excel and statistical analysis on software SPSS V 10.

RESULTS

From a total of 1565 samples, we isolated on all strains 1228 strains of gram-negative bacilli (BGN) with a frequency of 78.46%, 323 strains of Gram-positive cocci (CG +) or a frequency of 20, 64%, 14 strains of Gram-negative cocci (CG-) is a frequency of 0.9%. Figure 1.

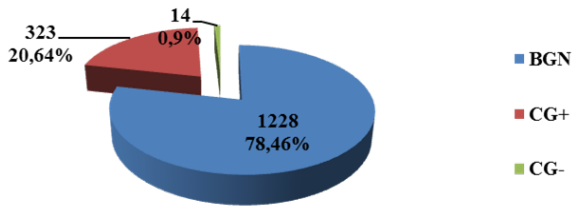

Figure 1: Diagram of the global distribution of isolates

The majority is represented by the female sex with a total of 1080 (69%) samples compared to the total sex male who was on the order of 485 (31%) levies. The sex ratio is 2.2. The distribution of isolates in relation to samples showed a predominance of UCBs which numbered 1076 (68.8%), vaginal specimens 195 (12.5%), urethral specimens 111 (7.1%), sputum 105 (6.7%), spermocultures 36 (2.3%), pus 28 (1.8%) and other various samples 14 (0.8%). Figure 2.

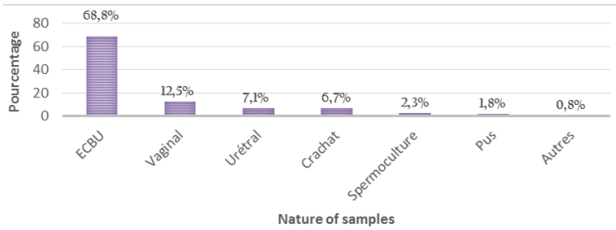

Figure 2: Diagram of the distribution of isolates according to the nature of the sample

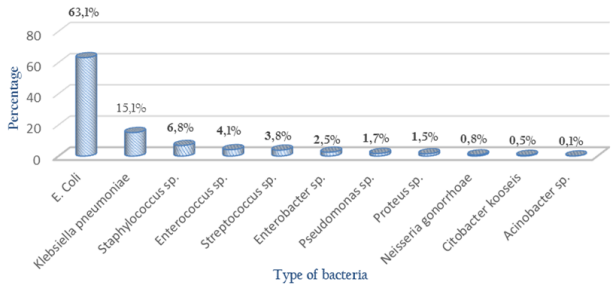

Figure 3: Histogram of the distribution of major bacteria

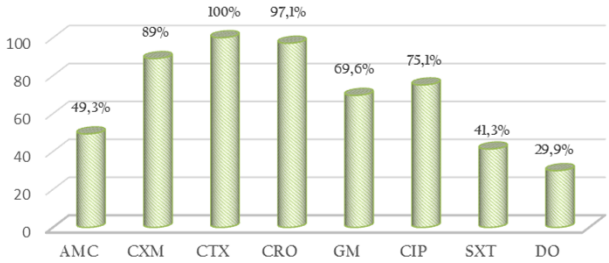

Figure 4: Diagram of susceptibility of enterobacteria to antibiotics

The distribution of isolated bacteria showed a prevalence of Enterobacteriaceae represented by *Escherichia coli* (*E. coli*) with a frequency of 986 (63.1%) followed by *Klebsiella pneumoniae* 235 (15.1%), *Staphylococcus sp* 106 (6.8%), *Enterococcus sp* 64 (4.1%), *Streptococcus sp* 59 (3.8%), *Enterobacter sp* 39 (2.5%), Pseudomonas sp 28 (1.7%), *Proteus sp* 25 (1.5%), *Neisseria gonorrhoae* 13 (0.8%), *Citrobacter koseri* 8 (0.5%) and finally *Acinetobacter sp* which was in the order of 2 (0.1%). Figure 3.

The sensitivity profile of enterobacteria to antibiotics is shown in Figure 4 with a frequency of amoxicillin + clavulanic acid (AMC) of 49.3 %, ceftriaxone

(CRO) 97.1%, cefuroxime (CXM) 89%, cefotaxime (CTX) 100%, gentamicin (GM) 69.6%, ciprofloxacin (CIP) 75, 1%, sulfamethoxazole-trimethoprim (SXT) 41.1% and doxycycline (DO) 29.9%.

DISCUSSION

In view of the results obtained, there is a strong female predominance with a sex ratio of 2.2. This predominance is justified by several studies showing that women have a high probability of contracting urinary tract infections. Several national studies attest to this, namely a study carried out in Rabat sex ratio, which was 2.33 (Bakili, 2016). Urine samples are the largest category of samples; they are the majority and therefore representative. Of all the isolated strains, BGNs are the majority of the isolates, and the main isolated bacteria are *E. coli* and *Klebsiella sp*. Studies at the national and international levels demonstrate this predominance of BGNs. In Rabat (Bakili, 2016), *E.coli* was found at the head of the wire with a frequency of 47.1%, followed by *Klebsiella pneumoniae* with 12.4%. At the international scale, in Algeria (Bentroki *et al.*, 2012), the predominance of *E. coli* represents a frequency of 53.33%, followed by *Proteus mirabilis* 10% and *Klebsiella pneumoniae* 10%. In France (Flores-Mireles *et al.*, 2015), bacteria are represented by *E. coli* in 74.0%, followed by *Klebsiella sp* 8.0%, *Proteus sp* 5.1%, and *Citrobacter sp.* 3.0%. From these studies carried out either nationally or internationally, it can be seen that *E.coli* remains the most predominant causative agent and responsible for bacterial infections, especially urinary infections (Hadeq, 2016).The results of susceptibility of E. coli to antibiotics shows that the bacterium has a high resistance to AMP with a frequency of 20.1% sensitivity (a resistance of 79.9%), a slight sensitivity with SXT (41.7%). This increases with the CIP (55.9%) and finally the CMA (60.1%). However, its sensitivity is important for cephalosporins and IMP (100%). The strong resistance of E.coli to the MPA is consistent with the different studies conducted nationally (Hadeq, 2016). However, an improvement in sensitivity to AMC is found in several cities (Bakili, 2016; Hadeq, 2016). Compared with cefotaxime, a study conducted in Algeria showed a higher sensitivity compared to our results (95%). No strains exhibited resistance to Imipenem. Our results are comparable to national and international ones (Bentroki *et al.*, 2012). This good activity of the imipenema is due to its expensive price and its limited use in the hospital. Bacteria produce a variety of enzymes, beta-lactamases, which inhibit the activity of antibiotics, especially aminopenicillins. However, this enzymatic activity is broken with clavulanic acid, which blocks the activity of these beta-lactamases.

CONCLUSION

The emergence of resistance in an out-of-hospital setting has become a global concern and a major public health problem. Many antibiotics are becoming more and more ineffective. This resistance can delay, hinder treatment and lead to complications and even death. Studies have yielded alarming results on the antibiotic resistance rate of bacteria involved in mainly urinary community infections. Awareness-raising action against the misuse of antibiotics, the standardization of therapeutic regimes and the issuing of preventive and curative recommendations would be desirable to control the spread of this phenomenon, which considers itself one of the major challenges of the new millennium.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

Funding Support

The authors declare that they have no funding support for this study.

REFERENCES

Bakili, Z. E. 2016. Profile of sensitivity bacteria to antibiotics in non-hospital settings in the city of Rabat. *Microbiology, Faculty of Medicine and Pharmacy of Rabat. MohamedV Souissi University*, page 138.

Bentroki, A. A., Gouri, A., Yakhlef, A., Touaref, A., Gueroudj, A., Bensouilah, T. 2012. Antibiotic resistance of strains isolated from community acquired urinary tract infections between 2007 and 2011 in Guelma (Algeria). *Annales de biologie clinique*, 70(6):666–668.

Flores-Mireles, A. L., Walker, J. N., Caparon, M., Hultgren, S. J. 2015. Urinary tract infections: epidemiology, mechanisms of infection and treatment options. *Nature Reviews Microbiology*, 13(5):269–284.

Hadeq, S. 2016. Profile of bacterial resistance to antibiotics in non-hospital settings in the city of sale. *Microbiology, Faculty of Medicine and Pharmacy of Rabat. Mohamed V Souissi University*, page 140.

Kahlmeter, G., Brown, D. F. J., Goldstein, F. W., *et al.* 2006. European Committee on Antimicrobial Susceptibility Testing (EUCAST) Technical Notes on antimicrobial susceptibility testing. *Clin Microbiol Infect*, 12(6):501–503.

WHO 2014. Antimicrobial resistance: global report on surveillance. *World Health Organization, Geneva, Switzerland*, page 257. ISBN: 978-92-4-156474-8.