

Research Article

## Importance of Bacterial Resistance in *Streptococcus pneumoniae* and *Streptococcus pyogenes* in the Center Region in Cameroon

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**Abstract** Respiratory tract infections are a real public health problem, and the few studies of African data make difficult the definition of a probabilistic rational therapeutic approach. The present study from May 2006 to June 2007 included 107 strains of *Streptococcus pneumoniae* and 94 strains of *Streptococcus pyogenes*. A single isolate was collected by topic, and the minimum inhibitory concentration (MIC) has been made by the E test method; 201 strains from 115 adults and 86 children were included in the study. From 107 strains of *S. pneumoniae*, 24 were from children; and from 94 strains of *S. pyogenes*, 62 came from child. From antibiotics susceptibility of *S. pyogenes*, 100% were sensitive to penicillin G, with MIC between 0.064 and 0.128; 20 were resistant to erythromycin; and 100% were sensitive to levofloxacin, chloramphenicol, amoxicillin, cefotaxime, and ceftriaxone. From *S. pneumoniae*, 95.3% were sensitive to penicillin G and 4.7% were intermediate; 19.3% were resistant to erythromycin; 100% were sensitive to levofloxacin, cefotaxime amoxicillin, and ceftriaxone.

**Keywords** respiratory tract infections; *S. pneumoniae*; *S. pyogenes*; bacterial susceptibility

### 1. Introduction

The discovery of the antibiotic and their use have strongly changed the course of life in the case of infectious diseases. But the emergence and the development of resistance of bacteria of the most frequent pathogen of respiratory tract to commonly prescribed antibiotics is a real problem for public health. Control of these resistances depends on the knowledge of their importance and their profiles.

If in many Europeans, North America, North Africa, and the Middle East countries, data are available, in Cameroon as in many countries of the sub-African region, managing infections of respiratory tract is generally probabilistic, which has consequences: on the one hand, a lack of data on the problem of resistance to antibiotics and other part, of the difficulties in defining efficient therapeutic protocols because the data used are not those of the local environment.

To improve on the one hand, the support of patients and on the other hand, the control of the resistance to

first-line antibiotics, it was important to have data to the local environment. Hence, this study entitled is “Importance of bacterial resistance in *Streptococcus pneumoniae* and *Streptococcus pyogenes* in the central region in Cameroon.”

### 2. Materials and methods

The study was conducted from May 1, 2006 to June 30, 2007. Samples were collected at Yaoundé hospitals, Mbal-mayo, and Akonolinga in the center region. A total of 201 isolates have been included in the study: 94 *S. pyogenes* and 107 *S. pneumoniae*. Demographics: ages, sex, type of sampling, and type of infection were collected. A single isolate has been included by patient. The minimum inhibitory concentrations (MICS) conducted by the E test (AB Biodisk Slona Sweden) method was performed.

Tested antibiotics were:

- (i) Penicillin, amoxicillin, ceftriaxone, cefotaxime, erythromycin, levofloxacin and chloramphenicol for *S. pneumoniae*.
- (ii) Penicillin, amoxicillin, ceftriaxone, cefotaxime, cefpodoxime, erythromycin, levofloxacin, and chloramphenicol for *S. pyogenes*.

Mueller-Hinton +5% sheep blood agar was used as a culture medium and incubated at 37 °C for 18 hours. The strain of *S. pneumoniae*, ATCC 49 619, was used as a quality control.

The Eucast critical concentrations were used to interpret the results of MICS.

### Ethical considerations

We obtain the agreement of the ethical committee of the Faculty of Medicine and Biomedical Sciences and also the consent of all participants or parent’s when participants were children.

**Table 1:** *Streptococcus pneumoniae* susceptibility to antibiotics.

Antibiotics	Eucast breakpoint (mg/L)										Eucast interpretation (%)			
	≤ 0.064	0.128	0.25	0.5	1	2	4	8	≥ 16	≤ S	> R	S	I	R
Penicillin G	102	5								0.06	2	95.3	4.7	
Amoxicillin	94	12	1							0.5	2	100		
Ceftriaxone	99	8								0.5	2	100		
Cefotaxime	98	7	2							0.5	2	100		
Erythromycin	37	19	29	1	2				19	0.25	0.5	80.4		19.6
Levofloxacin	37	21	47		2					2	2	100		
Chloramphenicol	48	13	44	1					1	4	8	99.1		0.9

**Table 2:** *Streptococcus pyogenes* susceptibility to antibiotics.

Antibiotics	Eucast breakpoint (mg/L)										Eucast interpretation (%)			
	≤ 0.064	0.128	0.25	0.5	1	2	4	8	≥ 16	≤ S	> R	S	I	R
Penicillin G	79	15								0.25	0.25	100		
Amoxicillin	48	46												
Ceftriaxone	77	16	1											
Cefotaxime	79	15												
Cefpodoxime	69	25												
Erythromycin	36	30	3	5	1	1			18	0.25	0.5	73.4	5.3	21.3
Levofloxacin	27	59	7	1						1	2	100		
Chloramphenicol	67	20	5	1		1				8	8	100		

### 3. Results

#### 3.1. Demographics

Two hundred one strains have been isolated from respiratory samples: community pneumonia ( $n = 5$ ), bronchitis ( $n = 67$ ), sinusitis ( $n = 11$ ), otitis media ( $n = 26$ ), throat ( $n = 97$ ). According to age, the 201 patients are divided into 86 children ( $\leq 17$  years) 40.7% and 125 adults. The female accounts for 47.4% of the population, with a sex ratio 1/1.1.

Among the 107 *S. pneumoniae*, 24 are isolated from samples (22.4%) in children and 83 in adults; 5 strains are isolated from community lung diseases, 11 from sinusitis, 25 of OMA, and 66 from bronchitis. Fifteen children were under 5 years (62.5% of children), and 6 are adults were over 64 years (7.2% of adults).

Among the 94 isolates of *S. pyogenes*, 92 are isolated from tonsillitis, one from bronchitis, and one of otitis media. Sixty-two patients (65.9%) were less than 17 years old.

#### 3.2. Sensitivity to antibiotics

##### 3.2.1. *S. pneumoniae*

Isolated strains are relatively sensitive to  $\beta$ -lactam antibiotics: 95.3% are sensitive to penicillin, and 4.7% of intermediate have MIC equal to 0.128 mg/L. All strains are susceptible to amoxicillin, ceftriaxone, and cefotaxime.

Erythromycin resistance reaches 19.6%. It is not resistant to levofloxacin, and 99.1% of the strains are susceptible to chloramphenicol.

##### 3.2.2. *S. pyogenes*

All strains are sensitive to penicillin G, amoxicillin, cefotaxime, ceftriaxone, cefpodoxime, levofloxacin, and chloramphenicol.

The resistance to erythromycin is 21.3%, and 5.3% of isolates are intermediates.

### 4. Discussion

*S. pneumoniae* is a major cause of high and low respiratory tract infections, invasive or not. Resistant to antibiotics is of concern in this species, and many studies are conducted around the world, but little data are available on the Equatorial region of Africa [1, 3, 4, 7, 8]. In Cameroon, the prevalence of strains of sensitivity decreased penicillin (PNSP) is very low 4.7%, with low MIC (0.128 mg/L) level. This percentage is in contradiction with those observed in countries of the African continent: Morocco (40.0%), Algeria (48.1%) Tunisia (57.8%) [2], and some of the European continent: France (57.8%) and Spain (40.6%) [5] Two of 5 strains of PNSP are isolated from a child. There is no resistance to amoxicillin, ceftriaxone, and cefotaxime.

Erythromycin resistance is equal to 19.5%. This is lower as compared to other African countries (20% in Morocco 39.6% in Algeria and 53.3% in Tunisia) [2].

Levofloxacin showed good activity since all strains are sensitive. Chloramphenicol resistance is at the level of that observed in Egypt [10].

All strains of *S. pyogenes* are susceptible to  $\beta$ -lactam antibiotics, which are observed in most studies [6, 9]; no

resistant strain has yet been described. The prevalence of erythromycin resistance is important because it is 26% much higher than observed in the North African strains (5.7%) [2] but close to the levels of the French strains (20–30%) [9]. It is not resistant to levofloxacin and chloramphenicol.

## 5. Conclusion

*S. pneumoniae* and *S. pyogenes* are very sensitive to  $\beta$ -lactam antibiotics; the level of resistance is lower than in many parts of the globe. These results may be due to the low antibiotic impregnation of the mostly rural populations. The strains erythromycin resistant are important. But it is important to follow these resistances on a regular basis because drugs against facts, development, and expansion of the resistors can be very fast.

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