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Epidemiology of Germs isolated from broncho-pulmonary infections at Batna's PHE (2018-2022)

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Abstract

Bronchopulmonary infections (BPIs) are a real public health problem, both in terms of frequency and treatment difficulties. They represent a pathogenic germs reservoir whose occurrence progresses over time, posing a serious therapeutic problem.

The aim of this study was to estimate the pulmonary infections prevalence and to study the germs isolated epidemiology at Batna's PHE.

This work is a retrospective descriptive epidemiological study carried out over an extending period from January 2018 to December 2022, covering all pulmonary origin samples received at the central laboratory of the Batna's Public Hospitalian Establishment (PHE Batna).

2,393 total samples were analyzed. The prevalence of IBPs was 10.44%. In our study, we found a women predominance (54.40%), the percentage of IBPs in adults was 88.80% and 11.20% in children. The greatest number of people infected was in autumn, 34.40% compared with 28% in winter and 21.20% in spring, while only 17.20 were found in summer. The majority isolated strains were Gram-negative bacilli, with BNF accounting for (40%) of isolates. *Pseudomonas aeruginosa* ranked first (22.69%), followed by *Streptococcus D* (12.69%), *Escherichia coli* (9.32%), *Pseudomonas sp.* (8.84%), *Haemophilus sp.* (5.38%), *Klebsiella pneumoniae* (5%), *Branhamella sp.* (5%) and *Streptococcus sp.* (4.61%).

These results may help to better understand and manage PBI in this region, focusing on the most frequent strains for the appropriate therapeutic strategies development.

Keywords: Bronchopulmonary infections; PHE; *Pseudomonas aeruginosa*; Epidemiology

1. Introduction

Bronchopulmonary infections are frequent, affecting almost all era types, and their severity is highly variable. They may be benign or, on the contrary, very serious and potentially fatal [1,2]. Respiratory diseases represent an enormous health burden worldwide [3]; acute respiratory infections were the subject of numerous WHO guidelines in the 1980-1990 decade, but were eventually relegated to the background, while pneumonia remained the leading cause of mortality (14% of deaths) in children under 5 worldwide [4]. According to the World Health Organization, it caused 740,180 child deaths in 2019 [5]. In France, bronchopulmonary infections represent over 12 million consultations a

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year, or 4-5% of general medical consultations [6,7]. In North American and European studies, mortality from pneumonia is 10-15% in hospitalized patients, rising to 36% in intensive care units [8]. It is estimated that 1-6% of the adult population (over 100 million people) suffer from sleep-disordered breathing, with millions living with pulmonary arterial hypertension (PAH) [9].

The world's deadliest cancer is lung cancer, which kills over 1.4 million people every year [10,11].

The microorganisms responsible for these infections could be bacteria, viruses or fungi. The bacterial etiology of pneumopathies varies according to the context (community-acquired or nosocomial), age and immune status of the patient [12]. *Streptococcus pneumoniae*, *Haemophilus influenzae* and *Staphylococcus aureus* are the most frequently implicated agents in community-acquired pneumonia requiring hospitalization. In the latter, they remain the most dominant species, followed by Gram-negative bacilli such as *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Escherichia coli*, which may be implicated [13].

The bacteria responsible for the infection can be identified by taking a number of samples, such as sputum, which has the advantage of being non-invasive, but remains a source of error (in over 50% of cases contaminated by saliva), and pleural fluid (PF), which is associated with pneumopathy in 20 to 40% cases [14,15]. The aim of this study was to estimate the prevalence of bronchopulmonary infections, as well as the epidemiology of germs isolated from samples received at the central laboratory of Batna's PHE.

2. Material and methods

This was a retrospective descriptive study of 2,392 pulmonary specimens, meeting the inclusion (both sexes, all ages and all isolated germs were included) and exclusion (specimens for the diagnosis of pulmonary tuberculosis and redundant specimens) criteria, received at the Batna's PHE central laboratory over a five-year period (January 2018-December 2022).

Data entry and analysis were performed on Excel software.

3. Results

2,392 total samples intended for the cytobacteriological study of bronchopulmonary secretions were collected by consulting the central laboratory's registration registers during the study period, 250 were positive, representing a percentage of 10.44%.

In addition, 277 samples (11.57%) were unsuitable for bacteriological study (PNC), 145 samples (6.05%) were intended solely for cytological study of pleural fluid and 1,720 negative cultures (NC), with an estimated percentage of 71.91%.

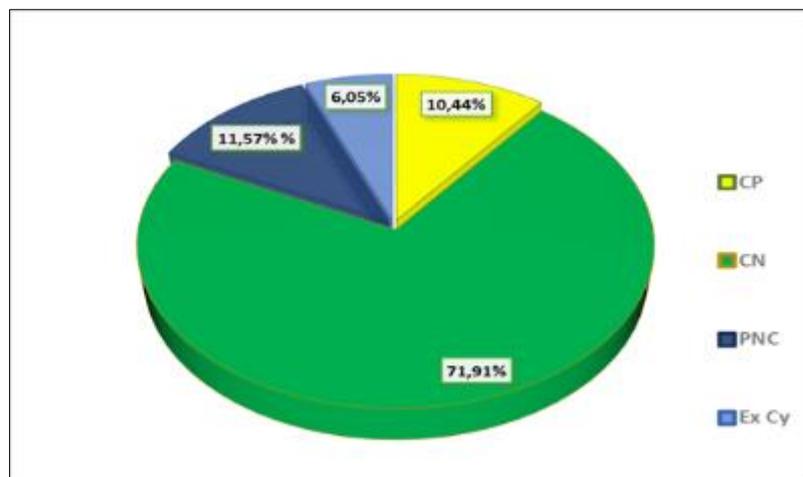


Figure 1 Samples distribution

The sample positivity evolution varied according to the study years; the highest number was observed in 2019, when 83 positive cultures were recorded (Table 1).

Table 1 Frequency of sample positivity by year

	2018	2019	2020	2021	2022
N ^o : CP3	36	83	39	19	73

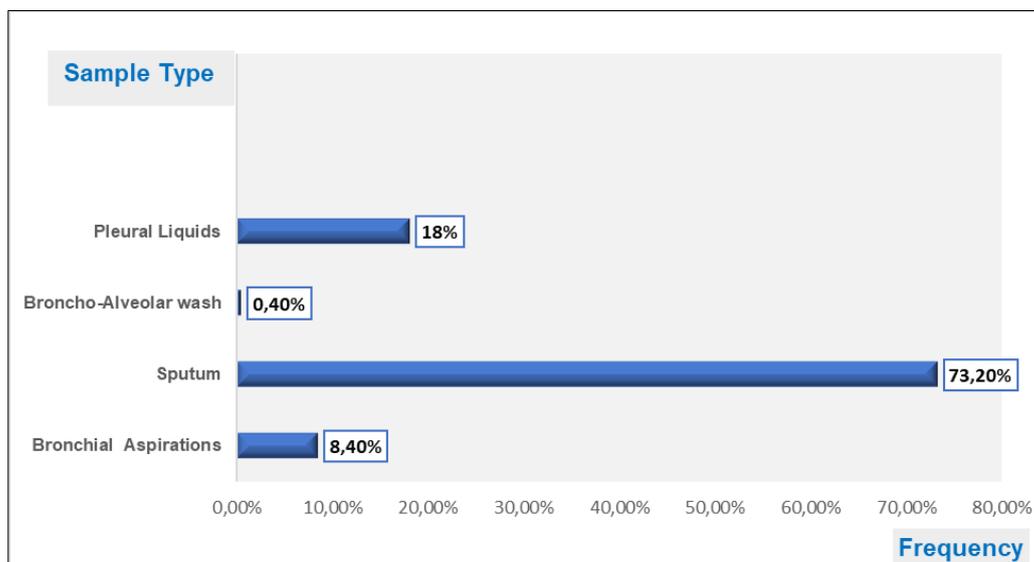


Figure 2 Distribution of positive cultures by type sample

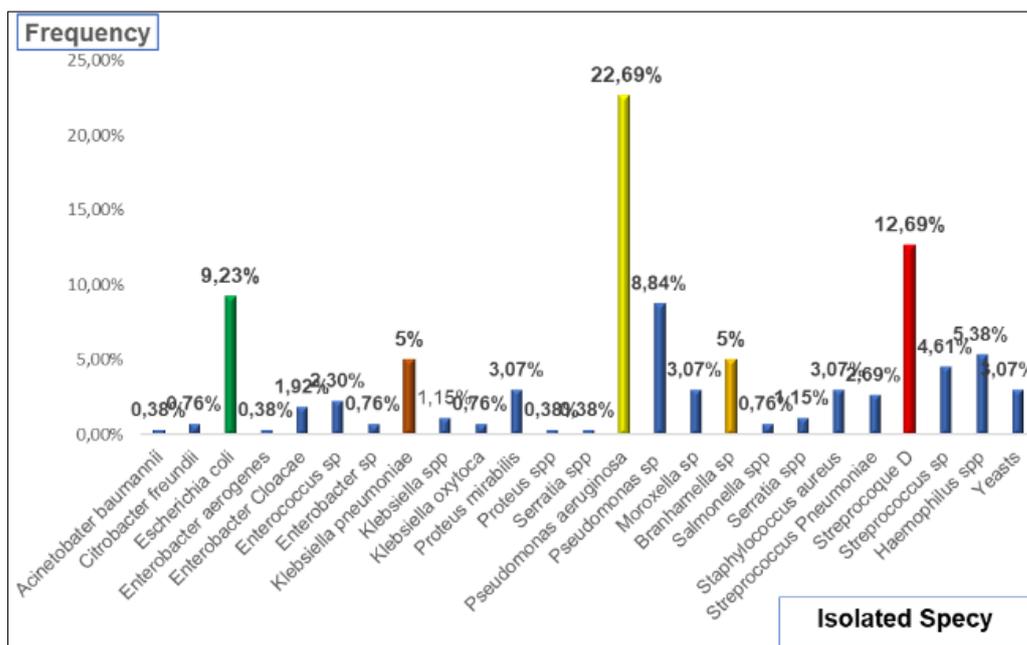


Figure 3 Distribution of germs isolated by species

The prevalence of bronchopulmonary infections in females was 54.40% versus 45.60% in males, with a sex ratio F/H= 1.19. A predominance of bronchopulmonary infections was observed in adults (89%) compared with the pediatric population (11%). From the total samples number included in this study, the greatest number was received in autumn (34.40%), 28% in winter, 21.20% in spring and 17.20% in summer. from 250 positive samples, the predominance was attributed to sputum (n=183), representing a percentage of 73.20%, followed by pleural fluids (n=45) (18%), in third place bronchial aspirates (n=21) (8.40%) and finally bronchoalveolar wash (n=1) (0.40%).

Concerning the isolated strains 75.76% (n=197) were Gram-negative bacilli, 21.15% (n=55) Gram-positive cocci. Yeasts were isolated from 8 cultures. Non-fermenting bacilli ranked first (40%), followed by Enterobacteriaceae (28.46%), Streptococci (20%) and, to a lesser extent, Pasteurellales and Staphylococci. *Pseudomonas aeruginosa* led the way among isolated strains, with an estimated frequency of 22.69%, followed by *Streptococcus D* (12.69%), *Escherichia coli* (9.32%), *Haemophilus sp.* (5.38%), then *Klebsiella pneumoniae* (5%) and *Branhamella sp* (5%), then *Streptococcus sp.* (4.61%). Only 4% of positive samples were polymicrobial, with 2 germs in all cases.

4. Discussion

In the present study we found a female predominance, a result concurring with the one found in the study that was conducted in the internal medicine department at Tunisian Rabta's HUC Rabta in Tunisia, between 2000 and 2012, where female predominance was found (29 females Vs 11h males) [16]. This difference between female and male gender is generally related to anatomical (lung size) and/or physiological (bronchial caliber) characteristics, including hormonal status and the cellular actions of androgens and estrogen-progestin hormones [17]. Adults occupy the first place compared to the pediatric population, our data corroborate with those found in the study that was conducted at the biology laboratory center of Bejaia's HUC during a 3-month period (February-May 2017), where 83% of the patients included in this study had an average age of 47.53 years [18]. In an American study of a cohort of 46,237 seniors aged 65 and over ; enrolled in the Group Health Cooperative who were observed over a three-year period. The incidence of CAP was 18.2 per 1,000 people per year between the ages of 65 and 69, and 52.3 per 1,000 people per year among those over 85 [19].

The results of our study are in line with the literature, where community-acquired pneumonia occurs more frequently in the autumn and winter months. Cold weather is a clearly favourable factor in the occurrence of respiratory infections, particularly in patients suffering from chronic bronchopneumonia [20]. Gram-negative bacilli are most frequently implicated in this type of infection, and our results are comparable to those reported by Djouabi. B and Leila. K (2020), who recorded a prevalence of 81.31% for BGN and 18.68% for Gram-positive cocci [21]. Among non-fermenting bacilli, *Pseudomonas aeruginosa*, is the most isolated, a result consistent with several studies including that carried out in the USA by Quartin et al. (2013) [22].

5. Conclusion

Bronchopulmonary infections represent a heavy health burden, due to their frequency, morbidity, mortality and socio-economic costs. They represent a major diagnostic and therapeutic challenge, requiring an integrated approach in which the essential role of the medical laboratory cannot be underestimated. Laboratory analyses, such as the microbiological examination of respiratory samples, enable precise identification of the pathogens responsible, whether viral, bacterial or fungal. These results guide clinicians to choose the appropriate antimicrobials, contributing to more effective, targeted treatment.

Compliance with ethical standards

Disclosure of conflict of interest

All authors declare that they have no conflicts of interest.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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