



Contents lists available at ScienceDirect

Journal of Infection and Public Health

journal homepage: <http://www.elsevier.com/locate/jiph>



## Epidemiology and microbiological profile comparison between community and hospital acquired infections: A multicenter retrospective study in Lebanon

Roula Matta<sup>a</sup>, Souheil Hallit<sup>a,b,c,d,e,\*</sup>, Rabih Hallit<sup>e</sup>, Wafaa Bawab<sup>a</sup>, Anne-Marie Rogues<sup>f</sup>, Pascale Salameh<sup>a,f,g</sup>

<sup>a</sup> Lebanese University, Faculty of Pharmacy, Beirut, Lebanon

<sup>b</sup> Occupational Health Environment Research Team, U1219 BPH Bordeaux Population Health Research Center Inserm – Université de Bordeaux, France

<sup>c</sup> Psychiatric Hospital of the Cross, Jal Eddib, Lebanon

<sup>d</sup> Saint-Joseph University, Faculty of Pharmacy, Beirut, Lebanon

<sup>e</sup> Holy Spirit University of Kaslik, Faculty of Medicine and Medical Sciences, Kaslik, Lebanon

<sup>f</sup> Unité INSERM 657, Bordeaux 2 University, Bordeaux, France

<sup>g</sup> Lebanese University, Faculty of Medicine, Beirut, Lebanon

### ARTICLE INFO

#### Article history:

Received 5 March 2017

Received in revised form 21 August 2017

Accepted 9 September 2017

#### Keywords:

Hospital

Community

Acquired infections

Resistance

### ABSTRACT

**Background:** The objective of this study is to identify and characterize the species resistance of different pathogens between community acquired and hospital acquired infections pointing at patients' related independent co-morbidities and socio-demographic factors.

**Methods:** It was a retrospective cohort, multicenter study from five private hospitals located in Beirut and Mount Lebanon. Two hundred fifty-eight adult patients were included.

**Results:** 110 Gram negative pathogens and 26 Gram positive pathogens were implicated in hospital acquired infections. The Gram-negative bacteria that showed a positive correlation regarding patient's type of infection were *Pseudomonas aeruginosa* (12%), *Klebsiella pneumoniae* (6.2%) and *Acinetobacter baumannii* (3.1%). These bacteria were more frequent in patients with hospital acquired infections ( $P = 0.002$ , 0.013 and 0.017 respectively). The ratio of methicillin resistant *Staphylococcus aureus*, Extended Spectrum Beta Lactamase producing *Escherichia coli* and *K. pneumoniae* and multi drug *P. aeruginosa* showed high significance in hospital acquired infections. The logistic regression, showed a significant relationship between resistant bacteria and age ( $p < 0.001$ , ORa = 5.680, CI [2.344; 13.765]) and immunosuppressed state ( $p = 0.003$ , ORa = 3.137, CI [1.485; 6.630]) and an inverse relationship for Chronic Obstructive Pulmonary Disease (COPD) ( $p = 0.006$ , ORa = 0.403, CI [0.212; 0.765]).

**Conclusion:** Our results confirm that hospital acquired infections/bacteria have higher rates of resistance when compared to community acquired; these rates increase with age, immunosuppression and are inversely proportional with COPD. Therefore, physicians should be aware of patients' comorbidities to properly guide initial therapy.

© 2017 The Authors. Published by Elsevier Limited on behalf of King Saud Bin Abdulaziz University for Health Sciences. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

### Introduction

Hospitals are a threatening environment because of a variable number of virulent pathogens that are brought to it from the community through admitted patients; these patients are then exposed

not only to the indigenous hospital flora but also to the flora of other sick individuals [1]. This is a result of impaired defense mechanism and the colonization of resistant microorganisms [2]. Hospital acquired infections are quite a common feature in the hospitals throughout the world. The prevalence of hospital acquired infections is generally higher in developing countries of limited resources [3]. These bacteria are generally resistant to antibiotics, owing to the heavy use of wide spectrum antibiotics in hospital settings, which puts a high selective pressure on bacteria and induces difficult to treat infections. Thus, hospital acquired infections have

\* Corresponding author at: Street 8, building 560, 1st floor, Biakout, Mount Lebanon, Lebanon.

E-mail address: [souheilhallit@hotmail.com](mailto:souheilhallit@hotmail.com) (S. Hallit).

<http://dx.doi.org/10.1016/j.jiph.2017.09.005>

1876-0341/© 2017 The Authors. Published by Elsevier Limited on behalf of King Saud Bin Abdulaziz University for Health Sciences. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

been recognized for over a century as a critical problem affecting the quality of health and a principal source of adverse healthcare outcomes [4].

Gram-negative bacteria are largely responsible for acquired infections. Multi-drug resistant strains are increasingly isolated in these settings, including carbapenemase-producing *Klebsiella pneumoniae*, *Acinetobacter* and *Pseudomonas aeruginosa* [5]. *Acinetobacter baumannii* has also become one of the most significant antibiotic-resistant bacteria causing hospital acquired infections worldwide [6]. One of the main methods through which Gram negative bacteria develop resistance is carrying genes coding for enzymes, such as beta-lactamases, hydrolyzing and inactivating beta-lactam antibiotics [7], beta-lactams being the most widely used class of antibiotics [8]. A major source of resistance in *Escherichia coli* are plasmid-borne Extended-Spectrum  $\beta$ -Lactamases (ESBL), which are classified as enzymes capable of hydrolyzing most  $\beta$ -lactams such as penicillins, extended-spectrum cephalosporins, and monobactams; ESBLs are not inhibited by  $\beta$ -lactamase inhibitors such as clavulanic acid, sulbactam, and tazobactam [9]. Based on this, community-onset ESBL infections have become an important public health issue [10].

Furthermore, *Staphylococcus aureus* gram-positive cocci can withstand harsh environments for extended periods allowing susceptible individuals to become infected through contact with persistently or transiently colonized people [11]. Thus, these bacteria are the most common hospital acquired pathogens with increased morbidity [12]. Penicillin-resistant strains appeared in hospitalized patients within a short time after the introduction of the antibiotic; methicillin, a  $\beta$ -lactamase-resistant derivative of penicillin, subdivides the species into sensitive and resistant subgroups. Methicillin-resistant *S. aureus* (MRSA) appeared in 1961, one year after methicillin was introduced into clinical use [13].

To our knowledge, no study has ever identified characteristics of bacteria comparing community and hospital settings in Lebanon. This multicenter study was designed to identify and characterize the species of different pathogens between community acquired and hospital acquired infections, pointing on patients' related independent co-morbidities and socio-demographic factors.

## Materials and methods

### Study design

This was a retrospective cohort, multicenter study from five private hospitals located in Beirut and Mount Lebanon over one year. Among these, three were university hospitals whereas two were non-university hospital. The study duration was 6 months.

### Population and data collection

The inclusion criterion was the infection diagnosis according to the Centers for Disease Control (CDC) criteria in an adult patient [14]. Only the first episode of infection in the hospital admission was characterized for each patient. Overall, 258 adult patients were included from the five hospitals in Beirut and Mount Lebanon.

Data were collected through a standardized sheet of patient identification. The record included patient-specific parameters such as demographic data, underlying diseases, and risk factors. The infection variables recorded positive culture, type of germs and antibiotic treatment with presence or absence of multi-resistant bacteria. Hospital acquired infections was defined as a localized or systemic condition that resulted from an adverse reaction due to the presence of infectious agents which occurred 48 h or more after hospital admission and was not incubating at the time of admission. Community acquired infections were defined as an infection

detected within 48 h of hospital admitted patients [15]. Age was classified according to the criteria of Acute Physiology and Chronic Health Evaluation (APACHE) score; for this reason, age was categorized into two subgroups less than 44 years and more than 44 years.

### Microbiology data

All participating medical centers were responsible for isolates identification and susceptibility testing. Each laboratory performed susceptibility testing according to their own standardized techniques based on current National Committee for Clinical Laboratory standards [16]. Data collected were primarily qualitative (resistant, intermediate or susceptible). All isolates of *E. coli* and *K. pneumoniae* were tested for extended-spectrum beta-lactamase production. *S. aureus* was tested for methicillin resistance. *P. aeruginosa* was tested for its multiple resistances. *Streptococcus pneumoniae* were tested against penicillin susceptibility.

### Comorbidity

The comorbidity of patients in the study included mainly immunosuppression, administration of chemotherapy in the 12 months prior to hospital admission, radiation therapy, administration of steroids for at least 3 months prior to hospital admission, infection with human immunodeficiency virus, chronic liver disease, chronic heart failure, chronic respiratory disease, chronic renal failure, hematological disease, cancer, and diabetes mellitus requiring insulin therapy or oral hypoglycemic agents before the infection.

### Data analysis

Statistical evaluation was conducted through bivariate and multivariable risk factor analyses, with the aim of identifying selected bacteria and independent factors associated with the presence of a hospital acquired infection compared to patients with a community acquired infection. Data was entered and analyzed, using Statistical Package for Social Sciences (SPSS) version 22 software. In all analysis, a p-value <0.05 was considered significant. The Chi<sup>2</sup> test was used for comparing categorical variables between groups; when expected values within cells were <5, Fisher exact test was used. A stepwise forward likelihood ratio multivariable logistic regressions was performed with the type of infection (community hospital acquired versus hospital acquired) as the dependent variable, and the characteristics presenting the lowest p-values in the bivariate analysis as the independent ones. The final model was selected after ensuring models adequacy to data by Hosmer–Lemeshow test.

## Results

### Population

258 patients were included in this study. Of all patients, 142 (55%) had a hospital acquired infection and 116 (45%) community acquired. Almost half of the patients (50.8%) patients were from community hospitals and (49.2%) from university hospitals.

### Correlation between hospital-acquired infection and clinical information

Bivariate analysis was done to assess the relationship between hospital acquired infection and patients' clinical information. Tachycardia was higher in patients with hospital acquired infections compared to the community (83.6% vs 64.1% p<0.001). Moreover, these patients had higher prevalence of tachypnea

Download English Version:

<https://daneshyari.com/en/article/8746755>

Download Persian Version:

<https://daneshyari.com/article/8746755>

[Daneshyari.com](https://daneshyari.com)