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Original article

Epidemiology of third-generation cephalosporin-resistant community-acquired Enterobacteria isolated from elderly patients

Épidémiologie des entérobactéries communautaires résistantes aux céphalosporines de troisième génération isolées de patients âgés

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Abstract

Aims. – This survey was made to study the epidemiology of multiresistant bacteria (MRB) in the French community, among elderly patients 65 years of age or more, carrying third-generation cephalosporin-resistant (3GC-resistant) Enterobacteriaceae, and the co-resistance of prescribed antibiotics.

Methods. – The data was collected in 2009 in the West of France by MedQual, a network of 174 private laboratories.

Results. – Two thousand one hundred and sixty strains of the 88,255 identified Enterobacteria strains were 3GC-resistant (2.4%) and 945 of these strains (41.8%) were isolated from elderly patients 65 years of age or more. *Escherichia coli* was the predominant 3GC-resistant strain (72.7%). 51.4% of the 945 patients in whom a 3GC-resistant strain was isolated produced an extended-spectrum β-lactamase (ESBL). The main risk factors for infection with the 3GC-resistant strain were hospitalization and antibiotic treatment in the previous year (58.2 and 86.9%, respectively). Hospitalization during the previous year was more frequent among elderly patients who lived at home compared with those who lived in nursing homes ($P < 0.05$). The production of ESBL, among the 945 patients who carried the 3GC-resistant strains, was similar among patients who lived at home compared with those who lived in nursing homes (51.4% *versus* 49.7%).

Conclusion. – Microbiologists should warn family physicians about MRB isolates with a specific antimicrobial resistance pattern (3GC-resistant, fluoroquinolone-resistant, etc.) to prescribe more effective medications.

Keywords: Community ecology; Enterobacteria; ESBL; Multi-drug resistant strain

Résumé

Objectifs. – Les objectifs de cette enquête étaient d'étudier l'épidémiologie des bactéries multirésistantes (BMR) dans la communauté française, incluant tous les patients porteurs d'entérobactéries résistantes aux céphalosporines de troisième génération (ER-C3G), parmi les patients âgés de plus de 65 ans et d'étudier les co-résistances aux antibiotiques.

Méthodes. – Les données ont été collectées pendant l'année 2009 dans l'ouest de la France par MedQual, un réseau de 174 laboratoires privés.

Résultats. – Parmi les 88 255 souches d'entérobactéries isolées, 2160 souches sont des ER-C3G (2,4 %), dont 945 souches (41,8 %) provenaient de patients âgés de 65 ans et plus. Une prédominance d'*Escherichia coli* a été observée (72,7 %). Parmi les 945 souches de patients chez lesquels une ER-C3G a été isolée, 51,4 % des entérobactéries isolées produisent une β-lactamase à spectre étendu (BLSE). Les principaux facteurs de risque étaient l'hospitalisation et l'antibiothérapie au cours de l'année précédente (58,2 et 86,9 % respectivement). L'hospitalisation pendant l'année précédente a été observée plus fréquemment pour les patients âgés de 65 ans et plus et vivant à domicile que pour ceux vivant en maison de retraite ($p < 0,05$). Parmi les 945 patients porteurs d'une ER-C3G, la production de BLSE était comparable parmi des patients vivant à domicile que parmi ceux hébergés en maison de retraite (51,4 % versus 49,7 %).

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Conclusion. – Les microbiologistes, devant certaines souches de BMR au profil particulier de résistance antimicrobienne (résistance aux C3G, fluoroquinolones. . .), devraient les signaler aux médecins généralistes pour une meilleure prescription.

Mots clés : Bactéries multirésistantes ; BLSE ; Écologie communautaire ; Entérobactéries

1. Introduction

The emergence of multi-drug resistant (MDR) strains in health care institutions has been a major health problem in France as well in Europe and the Americas. This problem has been largely documented in many countries [1–10]. In France, these MDR strains were the target of a national program against nosocomial infection from 2009 to 2013. These MDR strains are probably due to extensive antibiotic use and lapses in compliance with infection control measures in hospitals [11]. An alarming increase in infections due to extended-spectrum β-lactamase (ESBL) has been observed in non-hospitalized individuals, most frequently affecting the urinary tract. These bacteria have become widely prevalent in the community setting in various parts of the world, including several European countries (e.g., Spain, Italy, Greece, and the UK) [12–19].

The incidence of these MDR strains, however, is not well documented in the community. It was therefore important for us to study the emergence of MDR strains in the community because these bacteria are susceptible to only a small number of antibiotics. The first nationwide survey on ESBL Enterobacteria in the French community setting showed an overall prevalence rate of 1.1% in urinary tract infections, in 2006 [20]. A few authors have reported the epidemiology of MDR strains among nursing homes and in the community, in France [21].

The primary aim of this survey was to study the epidemiology of MDR strains in the French community. This survey included all elderly patients (65 years of age or more) carrying a third-generation cephalosporin-resistant (3GC-resistant) Enterobacteriaceae producing either ESBL or a high-level of cephalosporinase. The secondary aims of this survey were to study the co-resistance of the antibiotics and to determine the characteristics of elderly patients carrying the 3GC-resistant Enterobacteriaceae, including their medical history, previous hospitalization, risk factors for infection, and type of housing (home or nursing home).

2. Methods

MedQual, a center of information and resources for the appropriate use of antibiotics, was created in 2004 according to the Antibiotic National Plan of 2001 to protect the effectiveness of antibiotics. MedQual has since then created a network of private laboratories located in the West of France to survey the antimicrobial resistance of strains isolated in the community.

For this study, all private laboratories in the West of France were asked to participate in this study. These laboratories sent to the MedQual center the antibiograms of all 3GC-resistant Enterobacteriaceae that were isolated from diagnostic samples in 2009. Each laboratory sent to MedQual all the Enterobacteriaceae strains that were isolated from outpatients during the study period to assess the prevalence of 3GC-resistant Enterobacteriaceae in the community.

Antibiograms were performed by either an automatic liquid medium method (Vitek® 2 bioMérieux, Marcy l'Étoile, France) or the gel diffusion test. Strains were classified as susceptible, intermediately susceptible, or resistant, according to the 2009 recommendations of the Antibiogram Committee of the French Microbiology Society (http://www.sfm.asso.fr). Each laboratory specified the method used to perform the antibiogram and whether the strains produced an ESBL or not. Microbiologists informed the patient about this study and the data collection.

We included elderly patients 65 years of age or more, carrying the 3GC-resistant Enterobacteriaceae, as outpatients and patients from nursing homes. All patients from private hospitals and emergency departments were excluded. Doubloons were defined as 2 strains isolated from the same patient and the same sample.

An anonymous questionnaire was completed by the microbiologist for all patients 65 years of age or more carrying the 3GC-resistant Enterobacteriaceae. This questionnaire was used to document individual medical factors, previous medical care or hospitalization, clinical consequences (i.e., colonization/infection), and therapeutic care (Appendix A).

The data was collected and processed with the Epi Info computer database (version 6.04c, Centers for Disease Control and Prevention, Atlanta, GA, USA) within MedQual. Statistical comparisons were made using the Chi^2 test. A P-value <0.05 was considered as statistically significant.

3. Results

Five hundred and fifty-seven private laboratories were asked to participate, and 174 accepted (31%). During 2009, 88,255 Enterobacteria strains were identified, but only 2,160 of these Enterobacteria strains were 3GC-resistant. The prevalence rate for 3GC-resistant Enterobacteria was 2.4%. Among these 2,160 3GC-resistant strains, only 945 strains (41.8%) were identified in elderly patients 65 years of age or more.

Escherichia coli was the predominant strain ($n = 687$, 72.7%) observed among the 945 elderly patients carrying the 3GC-resistant Enterobacteria. Other common strains ($n = 258$) included *Enterobacter cloacae*, *Citrobacter freundii*, and *Morganella morganii.*

Four hundred and forty-six (64.9%) of the 687 3GC-resistant *E. coli* strains produced an ESBL.