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Epidemiological survey on incidence and treatment of community acquired pneumonia in Italy ☆

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Summary
Study objectives: To estimate annual incidence of community acquired pneumonia (CAP) in an Italian general population sample.
Design and participants: Two hundred and eighty-seven family practitioners (64.6% of those selected) recorded suspected or ascertained CAP cases for 1 year. Information on smoking habit, respiratory symptoms and signs, co-morbidity, antibiotic and corticosteroid therapy, hospitalization, mortality and recovery were obtained.
Results: Six hundred and ninety-nine case forms were collected (53.1% females, mean age 59.6±19.5, 20.6% smokers). CAP incidence rates per 1000 population were: 1.69 in men vs. 1.71 in women; 2.33 in the North vs. 1.29 in the Centre-South of Italy; between 0.73 in 14-, and 3.34 in 64+year-old subjects. Main symptoms and signs were cough (73.3%), crackles (72.8%), dullness (57.3%), asthenia (53.4%). 59.5% of subjects had concurrent diseases, mostly cardiac and respiratory. 77.2% of cases

Abbreviations: CNR, Italian National Research Council; CAP, community acquired pneumonia; LRTIs, lower respiratory tract infections, FP, family practitioner; ERS, European Respiratory Society; AIPO, Italian Association of Hospital Pneumologists; SIMeR, Italian Society of Respiratory Medicine; SIMG, Italian Society of General Practitioners; SPSS, Statistical Package for the Social Sciences; COM, "white forms" reporting information on diagnostic suspicion formulated directly by FP; HOS, "blue forms" reporting information on diagnosis made within the hospital; COPD, chronic obstructive pulmonary disease; IDSA, Infectious Disease Society of America; ATS, American Thoracic Society; BTS, British Thoracic Society; PORT, Pneumonia Patient Outcomes Research Team

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had chest X-ray (with parenchymal density in 90.6%). Phlegm microbiological examination was performed in 12.8% of cases. First choice antibiotics were cephalosporins (45.8%), macrolides (20.2%), other β-lactams (18.6%), and fluoroquinolones (12.2%). Rates of hospitalization and of mortality were 31.8% and 6.0%, respectively.

Conclusion: This study confirmed that the annual CAP incidence rate in the general population of South Europe is about 2 per 1000 population and showed a wide choice of antibiotic treatment.

Introduction

Lower respiratory tract infections (LRTIs), including pneumonia, account for elevated morbidity and mortality rates worldwide. In UK, respiratory infections are the most frequent cause of family practitioner (FP) consultation, accounting for about 6% of visits,[1] whereas hospital admissions for lung infections account for 4.4% of the total.[2]

In Italy, data collected by the Ministry of Health[3] throughout the Diagnosis Related Groups system indicate that in 1998 there were 113,766 hospital admissions for ''simple pneumonia and pleurisy'', corresponding to 1.16% of total hospital admissions. A more detailed analysis carried out in the Latium Region on data spanning from 1997 to 1999[4] reports an annual incidence of 158 hospital admissions per 100,000 population, with case fatality rates of 9.4% and 29.3% for community acquired pneumonia (CAP) and nosocomial pneumonia, respectively. In any case, wide variations in mortality have been found even in countries of similar social and health conditions such as Italy, UK and the USA, with rates ranging from 5 to 100 cases per year per 100,000 population.[5,6]

Unfortunately, CAP is not subject to mandatory notification; therefore incidence rates cannot be deducted from the routinely collected statistics. Few cohort studies have been so far carried out in North-Europe and UK, and they have obtained figures ranging between 4.7 and 11.6 cases per year per 1000 population.[7–9] Recently, incidence rates less than 2‰ in an area of Barcelona, Spain, and in two US cohort studies (Health Professionals Follow-up Study and Nurses' Health Study) have been reported.[10,11] Comparable data, although expressed in a different way and on a limited sample size, had been observed in France[12]: 1.72 CAP cases per FP per year. Further, among the few European countries for which incidence rates of pneumonia have been mapped in the 2003 European Respiratory Society (ERS) White Book on Respiratory Diseases,[13] Italy was not included due to lack of published reports.

Therefore, the aim of this paper is to describe the findings of a study designed to estimate the incidence rate of CAP and its treatment in Italy as reported by FPs during an observational period of 1 year.

Materials and methods

The epidemiological survey on the incidence of CAP in Italy (EPI-CAP 1999–2000 study) was planned by the Working Groups ''Epidemiology'' and ''Respiratory Pathophysiology'' of the Italian Association of Hospital Pneumologists (AIPO), by the Working Group ''Epidemiology'' of the Italian Society of Respiratory Medicine (SIMeR) and by the Italian Society of General Practitioners (SIMG), with the collaboration of the Pulmonary Environmental Epidemiology Unit of the CNR Institute of Clinical Physiology, Pisa.

A random sample of FPs living in 40 Italian provinces was selected. The provinces were chosen according to their closeness to the microbiological laboratories participating in a project of Epidemiological Monitoring of microorganisms causing respiratory infections, sponsored by SmithKline Beecham Italy. Whenever possible, FPs were selected among those affiliated to SIMG, which kindly provided us the list of its affiliates. In those areas where there were too few SIMG members, physicians were randomly selected from the province telephone directory.

The calculation of the population sample size was performed on the basis of an expected CAP incidence of 5 cases per year per 1000 population and by hypothesising a difference of 1‰ between the incidence in Northern Italy and the incidence in Central-Southern Italy, with a power of 90%. In order to obtain the expected number of physicians to be involved, the population sample size was divided by the average number of registered citizens for each physician. Thus, considering a conservative estimate of 1000 citizens per each physician, the expected number of FPs resulted

234. However, to accommodate for a possible large rate of dropout, such number was increased by 92%. Thus, 449 FPs were randomly selected.

Each selected FP was sent by courier mail the investigation tools and a letter explaining aim and methods of the study, along with the invitation to collect new cases of suspected CAP in the period February 15, 1999–February 14, 2000. At intervals, telephone calls to keep the physicians motivated were made during the study period.

There were two forms to collect data: the "white form", for each suspected CAP directly formulated by the FP, regardless of chest X-ray or laboratory confirmation; the "blue form", for each CAP diagnosed at the hospital where the patient had gone directly or had been sent by another physician on night-times or on week-ends, of whom the FP knew the conditions at the discharge from the hospital.

The "white form" was used to collect information on: subject's initials, anthropometric data, smoking habit, respiratory and systemic symptoms/diseases, corticosteroids and/or antibiotics taken in the last 30 days, diagnostic procedure (blood tests, serology, microbiology, chest X-ray), 1st and 2nd choice antibiotic treatment, hospitalization, and final outcome.

The "blue form" was used to collect information on: subject's initials, anthropometric data, respiratory and systemic diseases, conditions at hospital discharge, length of hospital stay, and antibiotic treatment at discharge.

Each FP was requested to follow his/her usual management and care procedures, with the exception of the invitation to ask the patient to collect a phlegm specimen to be analysed at the closest microbiological laboratory participating in the project. For this purpose, each FP received 10 containers for phlegm specimens to deliver to patients when needed.

Quarterly the forms were sent to the Pisa coordinating centre and fed into the computer.

Statistical analyses were performed with the Statistical Package for the Social Sciences (SPSS) version 10.0 for Windows. Frequency distribution, χ^2, analyses of variance were used to describe categorical and continuous variables, as well as multiple logistic regression models to identify risk factors for CAP incidence. A *P*-value of 0.05 was considered statistically significant.

Results

The overall participation rate of FPs in the study was 64% (287 out of the 449 invited FP; 81.1% affiliated to SIMG). These participants sent 699 data forms to the coordinating centre. There were 548 (78.4%) "white forms" reporting information on diagnostic suspicion formulated directly by FP (COM) and 151 (21.6%) "blue forms" reporting information on diagnosis made within the hospital (HOS).

Anthropometric characteristics, residence and smoking habits are reported in Table 1. Numbers vary in the categories due to different missing values. There were slightly more women (53.1%) than men (46.9%). HOS subjects were older than COM subjects of about 9.1 years. A total of 94.4% lived at home and 5.6% in a nursing home. There were 20.6% smokers, 26.7% ex smokers and 52.7% non-smokers. COM subjects showed a lower proportion of ex smokers, whilst HOS subjects had lower frequencies of smokers and non-smokers. When we assessed possible differences between SIMG and no-SIMG FP, we found that the former reported data on slightly older patients (60.0 ± 19.1 vs. 58.4 ± 18.7 years, $P < 0.05$) who lived less frequently in nursing homes (3.7% vs. 10.4%).

Annual CAP incidence per 1000 population was calculated on the basis of the average number of citizens enrolled in FP lists (Table 2). CAP incidence was slightly higher in women (1.713‰) than in men (1.692‰). There was a geographical gradient according to the inverse of latitude (North: 2.332‰ vs. Centre-South 1.288‰). The rate increased with ageing ranging from 0.734‰ in children less than 14 years up to 3.338‰ in the elderly (64+year). There was no difference between SIMG and no-SIMG FP.

The following analyses refer to the 548 COM subjects. Most frequently reported symptoms were those of new onset (Table 3): cough (73.3%), asthenia (53.4%), dyspnea (43.3%), phlegm (43.1%) (mucous-purulent in 44.3% of cases), chest pain (50.0%). Almost 89.1% of subjects had fever, and 59.5% exhibited one or more concurrent diseases, mainly hypertension (33.0%), chronic bronchitis (22.3%), emphysema (18.9%), heart diseases (23.3%). When compared to no-SIMG FP ones, SIMG FP's patients had slightly increased frequencies of dullness (60.1 vs. 50.3%, $P < 0.05$), dyspnea (new onset: 47.2 vs. 33.6%, worsened 13.7% vs. 5.4%, $P < 0.05$), tachypnea (41.8 vs. 26.8%, $P < 0.05$) and a slightly lower frequency of phlegm (new onset: 37.8 vs. 56.7, worsened 19.2 vs. 12.0%, $P < 0.05$).

With regard to chest physical examination, new onset of crackles (72.8%) and dullness (57.3%) showed the highest prevalence rates (Table 4). 413 subjects (77.2%) performed chest X-ray. Reasons of not performance were logistical difficulties (50.8%), patient's refusal (8.2%), deemed as not

Table 1 Subjects' characteristics: gender, anthropometric measures, habitual residence, smoking habit, comorbidity.

	Community	Hospital
Sex ($n = 699$)		
Males ($n = 328$)	256 (46.7%)	72 (47.7%)
Females ($n = 371$)	292 (53.3%)	79 (52.3%)
Anthropometric measures[†]		
Age ($n = 699$), yr	57.6 ($\pm$19.2)	66.7 ($\pm$18.7)
Height ($n = 677$), cm	167.8 ($\pm$8.5)	165.3 ($\pm$8.1)
Weight ($n = 679$), kg	68.7 ($\pm$14.7)	65.3 ($\pm$13.0)
Usual residence[†]		
House ($n = 642$)	509 (95.3%)	133 (91.1%)
Resting home ($n = 38$)	25 (4.7%)	13 (8.9%)
Smoking habit[‡]		
Smokers ($n = 141$)	116 (21.7%)	25 (16.7%)
Ex smokers ($n = 183$)	133 (24.9%)	50 (33.3%)
Non-smokers ($n = 361$)	286 (53.5%)	75 (50.0%)
Comorbidity		
Heart diseases ($n = 695$)[§]	94 (17.3%)	68 (45.0%)
Neurological diseases ($n = 682$)[§]	37 (6.9%)	25 (16.9%)
Diabetes ($n = 692$)	57 (10.5%)	18 (12.2%)
Hypertension ($n = 694$)[¶]	164 (30.2%)	65 (43.0%)
Neoplasms ($n = 692$)	49 (9.1%)	12 (7.9%)
Chronic bronchitis ($n = 676$)[¶]	118 (22.3%)	60 (40.8%)
Asthma ($n = 667$)[¶]	46 (8.7%)	23 (16.4%)
Emphysema ($n = 661$)[§]	98 (18.9%)	49 (34.5%)

[†] $P < 0.05$.
[‡] $0.05 > P < 0.1$.
[§] $P < 0.001$.
[¶] $P < 0.01$.

Table 2 Incidence of pneumonia in EPI-CAP survey.

	No. of CAP	Mean of subjects registered per FP	Total registered subjects	Incidence (‰)
Total	699	1430.082	410433.51	1.703
Males	328	675.526	193875.87	1.692
Females	371	754.556	216557.64	1.713
$\leqslant$14 years	10	47.353	13590.23	0.734
15–44 years	158	601.364	172591.60	0.915
45–64 years	207	443.193	127196.43	1.627
$>$64 years	324	338.172	97055.25	3.338
North	380	1262.690	162887.01	2.332
Centre-South	319	1566.750	247546.50	1.288

Number of family practitioners: Total 287, North 129, Centre-South 158.

necessary by FP (41.0%). In almost all radiographs there was one or more parenchymal densities. Pleural effusion was reported in 45 subjects (10.9%), almost always associated to parenchymal density. Other unspecified broncho-pulmonary impairment was reported in 54 subjects (13.1%). There was no difference between SIMG and no-SIMG FP.

Very few subjects (12.8%) performed a microbiological phlegm examination. Reasons of not

Table 3 Prevalence rates (%) of symptoms and diseases in subjects with suspicion of CAP.

Symptoms	
Cough ($n = 546$)	
New onset	73.3
Exacerbation	23.8
Phlegm* ($n = 536$)	
New onset	43.1
Exacerbation	17.2
Dyspnea ($n = 540$)	
New onset	43.3
Exacerbation	11.3
Dehydration ($n = 527$)	
New onset	8.3
Exacerbation	3.2
Asthenia ($n = 541$)	
New onset	53.4
Exacerbation	18.5
Confusion ($n = 532$)	
New onset	6.0
Exacerbation	5.5
Fever ($n = 542$)	89.1
Chest pain ($n = 532$)	50.0
Tachypnea ($n = 541$)	37.5
Diseases	
Heart diseases ($n = 695$)	23.3
Neurological disease ($n = 681$)	9.1
Diabetes ($n = 694$)	10.8
Hypertension (n = 694)	33.0
Neoplasms ($n = 693$)	8.8
Chronic bronchitis ($n = 529$)	22.3
Asthma ($n = 527$)	8.7
Emphysema ($n = 519$)	18.9

*Phlegm aspect ($n = 318$): mucous 55.7%; mucous-purulent 44.3%.

Table 4 Prevalence rates (%) of lung sounds and chest X-ray findings in subjects with suspicion of CAP.

Dullness ($n = 525$)	57.3
Ronchi/wheezes ($n = 508$)	50.6
Coarse crackles ($n = 537$)	
New onset	72.8
Worsening	11.9
Chest X-ray* carried out ($n = 535$)	77.2
Chest X-ray carried out ($n = 413$), more answers	
Increased parenchymal density	90.6
Pleural effusion	10.9
Other pulmonary signs	13.1

*Chest X-ray not performed $n = 122$ (22.8%): 50.8% for logistical reasons; 8.2% for patient's refusal; 41.0% deemed as not necessary by FP.

performance were lack of phlegm (27.2%), logistical difficulties (48.5%), patient's refusal (11.5%).

Antibiotics were prescribed as follows: cephalosporins (45.8%), macrolides (20.2%), other β-lactams (18.6%), and fluoroquinolones (12.2%). In Table 5, first choice antibiotics, singly or in combination, are reported (mutually exclusive groups). Those prescribed in more than 10% of cases were cephalosporins (27.1%), macrolides (18.0%), other β-lactams (13.0%), fluoroquinolones (12.0%), and the combination cephalosporins plus macrolides (11.7%).

Rates of hospitalization and of mortality on the whole CAP population were 31.8% (11.5% for COM subjects) and 6.0% (4.4% for COM subjects, 10.7% for HOS subjects), respectively. There was no difference between SIMG and no-SIMG FP in the CAP management or outcome.

In Fig. 1, significant and borderline odds ratios to have increased parenchymal density at chest X-ray (derived from logistic regression model, accounting for age, gender, residence, geographical area) are reported for COM subjects. Cough, dyspnea, and chest pain were the symptoms associated with the health outcome. The risk was significantly increased by the condition of being ever smoker, whilst it was decreased by having neurological disorders or asthma.

Heart diseases, neurological diseases, neoplasms, bronchial asthma, living in the Northern geographical area and previous corticosteroid therapy were significant risk factors for the hospitalization (derived from logistic regression model, accounting for age, gender, residence, smoking habit) on the whole sample (COM and HOS subjects) (Fig. 2).

Discussion

The EPI-CAP 1999–2000 study has provided to our knowledge the first estimates of CAP incidence in Italy on the basis of a virtual sample of about 410,000 Italian citizens registered in the lists of 287 FPs.

The internal validity of the studied cases is shown by the differences in some characteristics among COM and HOS patients: the latter were older, resided more frequently in nursing homes, were less frequently current smokers and more frequently ex smokers, reported more frequently comorbidities. Further, although there were few differences of no clinical importance in anthropometric characteristics, in symptoms and physical examination among the patients followed by SIMG

Table 5 Frequency of antibiotics use in subjects with CAP suspicion, singly and in combination (mutually exclusive group).

	No. of cases	% of use
Cephalosporins	144	27.1
Macrolides	96	18.0
β-Lactams	69	13.0
Fluoroquinolones	64	12.0
Cephalosporins+macrolides	62	11.7
Others	18	3.4
Cephalosporins+others	18	3.4
Cephalosporins+fluoroquinolones	17	3.2
β-Lactams+others	12	2.3
β-Lactams+macrolides	11	2.1
Macrolides+others	7	1.3
Macrolides+fluoroquinolones	5	0.9
β-Lactams+cephalosporins	2	0.4
β-Lactams+fluoroquinolones	2	0.4
Cephalosporins+fluoroquinolones+others	2	0.4
Fluoroquinolones+others	1	0.2
β-Lactams+macrolides+fluoroquinolones	1	0.2
β-Lactams+cephalosporins+macrolides	1	0.2

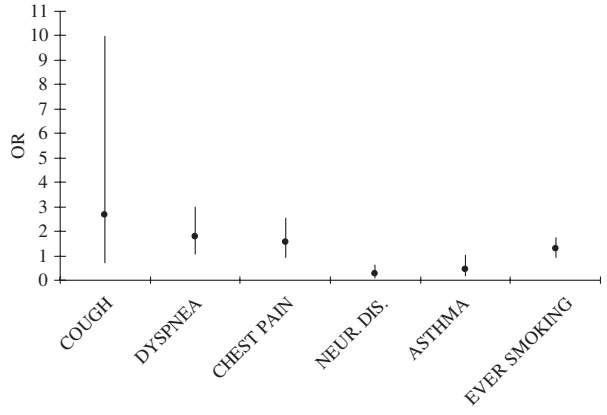

Figure 1 Odds ratios (OR) and 95% confidence intervals (95% CI) to have increased parenchymal density at chest X-ray (derived from logistic regression model, accounting for age, gender, residence, geographical area) among COM subjects.

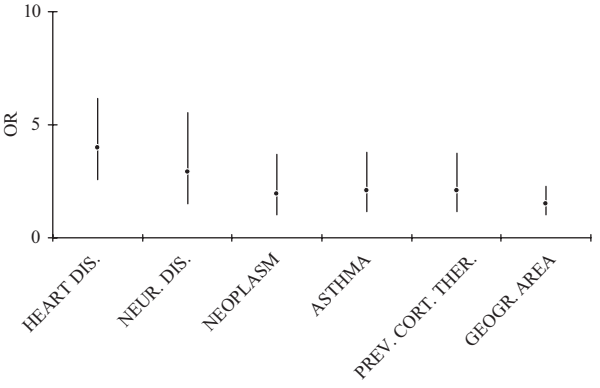

Figure 2 Odds ratios (OR) and 95% confidence intervals (95% CI) for the hospitalization (derived from logistic regression model, accounting for age, gender, residence, smoking habit) in the whole sample (COM and HOS subjects).

and no-SIMG FP, there was no difference between SIMG and no-SIMG FP in the CAP management or outcome.

The incidence rate of 1.703‰ is low with respect to the expected CAP incidence of 5 cases per year per 1000 population, as hypothesised prior to the survey. This might be explained by a unidirectional ''report bias'',[14] due to a tendency to report only the most severe suspected cases of CAP with the consequence of yielding conservative estimates. Another possibility would be the missing of some cases directly hospitalized who might have omitted to report the disease to their FP after the discharge. Unfortunately, the coordinating centre had no possibility to independently check the completeness of the data forms provided by physicians living in 40 Italian provinces. It is also to point out that in Italy, children are quite commonly referred directly to a paediatrician and the incidence of CAP might be underestimated using FPs as the sampling frame for subjects younger than 15 years ($n = 10$). However, we did not find an incidence of CAP in the 15–44 years

age-class significantly higher than in the youngest age-class. This result does not support the hypothesis of a relevant referral bias for children in this study.

Conversely, the lack of radiological confirmation in about one-fifth of cases let us hypothesise the presence of a unidirectional ''information bias'' [14] determining an overestimate of CAP cases by possible inclusion of people with acute exacerbations of chronic bronchitis. However, among those with chest X-ray, 97% were reported to have parenchymal densities: it argues against a relevant ''information bias''.

Further, the age unbalance of our sample, besides reflecting the ageing of the Italian population (>15% is now over 65 years), also corresponds to the fact that the elderly have more often access to primary care because they have more often comorbidity. Moreover, they also have increased risk to get infectious diseases like pneumonia. Also such an unbalance might cause a unidirectional bias towards a possible overestimation of CAP incidence rates due to the inclusion of subjects, which might not have such disease.

In any case, the net result of these potential opposite biases had likely a very minor effect on the reliability of our estimates in so far as the annual incidence rates of CAP found in the present study are very close to the value of 1.62 per 1000 population found in Barcelona[10] and to the value of 1.72 cases per FP found in France,[12] and they are lower than those reported in Northern-Europe and UK.[8–10] It should be noticed that, out of 13 European countries for which incidence rates of pneumonia have been reported in the European Respiratory Society White Book on Respiratory Diseases,[13] only Spain, France and the Czech Republic have shown figures lower than 3‰ and that Lithuania and Estonia have rates between 10‰ and 14‰, whilst Germany has an incidence rate of 16.87‰. One could argue that some inaccuracies in the estimates of CAP incidence rates might be originated by the use of a virtual population in our study. However, it would not be feasible to organize a study in which all the about 410,000 registered subjects had to be actively contacted by the FP for 1 year. Due to the inherent severity of CAP, it is reasonable to assume that almost all cases have approached their own physician, even if previously managed by another professional or structure of the National Health Service. Indeed, the consistency of results in Italy and in other countries strongly supports the validity of our approach.

In addition, the difference in the incidence rates of North and Centre-South of Italy was 1.044‰, i.e. almost identical to the 1‰ estimate made prior to the study. It is known that also pneumonia mortality is lower in the South than in the North of Italy,[15] although socio-economic conditions are on average less wealthy in the former area. This may be a clue of the beneficial effect of mild Mediterranean climate on respiratory infections. Such a statement is supported by recent evidences in the USA[16] linking mortality to extreme temperatures and showing beneficial effects of living in areas at mild temperate climate.

The new onsets of fever, cough, asthenia, along with crackles and dullness at chest physical examination were the most important symptoms and signs by which FPs were induced to formulate the CAP diagnosis, confirming other reports in the literature.[17] However, it is well known that there is a large inter-observer variation in recognising certain findings[18] and there are no individual clinical findings, or combination of findings that can rule in the diagnosis of pneumonia for a patient suspected of having this illness.[19] In any case, although most patients with CAP can be managed successfully in the community by their FP without investigations, distinguishing CAP from other causes of respiratory symptoms and signs in the absence of further investigations can be difficult, particularly when the presence of comorbidity, such as left ventricular failure, chronic lung disease, or COPD, contributes to increase the complexity of clinical picture.[20] Moreover, the elderly frequently represent a particularly difficult diagnostic challenge because of presence of non-specific symptoms and signs.

Chronic bronchitis and emphysema, by showing higher prevalence rates than in the general population,[21] confirm to be important risk factors for CAP, along with hypertension and cardiovascular disease.[22] This evidence may be of pivotal importance when considering the opportunity of having a more proactive behaviour towards preventive measures in the primary care of these patients.

Almost 80% of subjects performed chest X-ray and 11.6% did not due to reported logistic difficulties. These figures can be considered an acceptable CAP management in general practice. Indeed, the guidelines of the Canadian Infectious Disease Society and of the Canadian Thoracic Society consider acceptable the empirical treatment of CAP without radiological confirmation, when it is difficult to go to the radiological clinic.[23] However, 9.1% of subjects did not perform chest X-ray since it was deemed as not necessary by FP. This decision indicates an insufficient application of international guidelines on diagnosis and management of CAP, such as those of the Infectious Disease Society of America (IDSA),[24] American Thoracic Society (ATS),[25] and British Thoracic Society

(BTS),[20] which recommend the inclusion of chest X-ray in the usual diagnostic procedures of suspected CAP. Furthermore, as suggested by Lieberman et al.,[17] the ability of physicians to negate X-ray confirmed pneumonia by clinical assessment in febrile adult LRTI patients is good, but the ability to successfully predict this condition is poor.

Phlegm was reported by 60.3% of patients, but microbiological sputum examination was performed in only 12.8%, mainly because of logistical difficulties (48.4%), although each FP had been provided of containers for phlegm collection and the Microbiological Laboratories were not far from the residential zones. It is to point out that the US Pneumonia Patient Outcomes Research Team (PORT) Cohort Study[26] found that only 29.7% of 944 ambulatory CAP patients had undergone microbiological examinations and in only 5.7% was possible to detect a specific cause of CAP. In any case, the role of routine microbial investigation of patients with pneumonia in the community[27] and even all adults admitted to hospital with CAP[28] remains unclear. Thus, sputum collection has not been recommended as part of a management algorithm when a patient with CAP is treated in a primary-care hospital that does not have on-site microbiology facilities.[29]

The lack of information on pathogen microorganism makes it more difficult to comment the results on antibiotic prescriptions by FPs. Indeed, monotherapy was chosen in 70.1%. Since 88.5% of these patients were followed at home and were likely affected by less severe forms of disease than those requiring hospitalization, such management behaviour fits with the suggestions of main guidelines on CAP treatment.[20,23,25]

Conversely, the empirical choice of the type of antibiotic seems more questionable because it generally diverged from recommendations of the most important CAP treatment guidelines.[20,23–25] However, diversities in local health systems, sources of information at the clinician's disposal[30] and, more important, local therapeutic traditions, and marketing factors can justify the observed differences.[31]

Cephalosporins (45.8%) were prescribed in more than a quarter (27.1%) singly and in about one fifth (18.7%) in combination with other antibiotics. This finding is in accordance with the previous documentation that third-generation cephalosporins are the most frequent prescriptions in initial antibiotic therapy for community LRTIs in Italy.[32]

The use of macrolides (18.0% singly, 20.2% in combination) is more adherent to all practice guidelines, although there are contraindications in using such antibiotics as monotherapy because of the risk of *Streptococcus pneumoniae* strains resistant to macrolide and azalide agents, despite their excellent activity against most other pathogens.[33,34]

Fluoroquinolones were used in 12.0% singly and in 12.2% in combination. We must stress that, when the survey was performed, only the 1998 IDSA guidelines suggested the use of such antibiotics.[35]

Conversely, the infrequent use of other β-lactams (13.0% singly, 18.6% in combination) seems to be in contrast with the guidelines. Such limitation might have been caused by the fear of the possibility that penicillin-resistant microorganisms were the cause of CAP.[36,37] Indeed, the 1999 results of the Italian Epidemiological Observatory showed that penicillin resistance in *S. pneumoniae* was 10.2% with high level resistance accounting for 4.1%. Amoxicillin, co-amoxiclav and injectable third generation cephalosporins were the only drugs capable of overcoming intermediate resistance to penicillin in most *S. pneumoniae* isolates.[38]

Although mortality rates were quite similar (6.0% in Italy, 5% in Spain), hospitalization rate (31.8%) was lower than in the Spanish study (61.4%)[10] indicating possible differences in the severity of the diseases and in the usual management of CAP by FP. In Italy, heart diseases, neurological diseases, neoplasm, asthma, living in the Northern geographical area and previous corticosteroid therapy pneumonia were significant risk factors for the hospitalisation, seeming to indicate an appropriate management.

Overall, CAP continues to be an important socioeconomic burden in the year 2000, indicating the need to implement preventative strategies through the increase of the proportion of subjects vaccinated against influenza virus and against pneumococci. Recent data foster a wider use of pneumococcal vaccine, especially in children and in the elderly.[39–40]

In conclusion, this collaborative study of FP and pulmonologists has confirmed that the annual CAP incidence rate in the general population of South Europe is slightly less than 2 per 1000 population and has shown a wide choice of antibiotic treatment.

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