Antibiotic Prescription Rates Vary Markedly Between 13 European Countries

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There is a lack of data on antibiotic utilization in most European countries. In this study, information about the number of antibiotic prescriptions was obtained for Austria, Belgium, Finland, France, Germany, Greece, Italy, The Netherlands, Portugal, Spain and the UK from the Institute for Medical Statistics Health Global Services in the UK. For Denmark and Sweden the information was obtained from the Danish Medicines Agency (Laegemiddelstyrelsen) and the National Corporation of Swedish Pharmacies (Apoteket AB), respectively. Between 1994 and 1997 the number of prescriptions per 1,000 inhabitants increased in France and Greece whilst Portugal, Spain and Sweden reported a decrease. In 1997, Greece (1,350), Spain (1,320) and Belgium (1,070) had the highest numbers of antibiotic prescriptions per 1,000 inhabitants in the community and antibiotic use.

Studies have shown higher resistance rates in Southern than in Northern Europe, in terms of both community-acquired and in-hospital infections (9–11). The lack of publicly available, comparable data on antibiotic utilization in most European countries has, however, hindered the drawing of conclusions regarding a relation between resistance and antibiotic use. The primary aim of this study was to compare and analyse the number of antibiotic prescriptions per 1,000 inhabitants in 13 European countries in 1994 and in 1997.

MATERIALS AND METHODS

Prescription data

Data on antibiotic prescriptions for 1994 and 1997 from 11 countries (Austria, Belgium, Finland, France, Germany, Greece, Italy, The Netherlands, Portugal, Spain and the UK) were obtained from the Institute for Medical Statistics (IMS) Health Global Services. The data from these countries were generated in doctors’ offices and were collected from a sample of office-based doctors, including general practitioners (GPs) and those working in the major clinical specialties. For each country, the data had then been extrapolated to a national level.

Antibiotic prescription data for Denmark were only available for 1997 and were obtained from the Danish Medicines Agency (Laegemiddelstyrelsen). The Swedish data for 1994 and 1997 were obtained from the National Corporation of Swedish Pharmacies (Apoteket AB). The Danish data did not allow identification of all antibiotic subgroups. The Swedish and Danish data included antibiotic drugs dispensed at pharmacies in the respective countries. Information about the total populations in 1994 and 1997 was gathered for all the included countries (12). To make comparisons between countries possible, the numbers of prescriptions were converted into numbers of prescriptions per 1,000 inhabitants.

Antibiotic classification

All prescriptions were arranged according to the Anatomical Therapeutic Chemical (ATC) classification system for drugs used by the WHO (13). Drug substances, which are not mentioned in the WHO ATC index, were sorted into the categories suggested by Martindale (14).

Prescriptions for both trimethoprim alone and for trimethoprim in combination with sulphonamides were placed in the group J01E A (trimethoprim alone or in combination) as the IMS data did not allow a distinction between trimethoprim alone or in combination. The prescriptions in the IMS Health Global Services database which were classified as “composition unknown” were excluded from the study as no information was available about what drugs this group contained. The total number of prescriptions in this group was 2 million, which was only 0.16% of the total number of prescriptions.
RESULTS

The number of prescriptions per 1,000 inhabitants in 1994 and 1997 is shown in Fig. 1. In 1997, Greece, Spain and Belgium had the highest number of antibiotic prescriptions per 1,000 inhabitants (1,350, 1,320 and 1,070, respectively) and The Netherlands, Sweden and Austria had the lowest (390, 460 and 480, respectively) (Table I). Between 1994 and 1997, France and Greece had an increase in prescriptions per 1,000 inhabitants and Spain, Portugal and Sweden a decrease.

A beta-lactam antibiotic was the most prescribed antibiotic in all countries in 1997. Extended-spectrum penicillin was the most prescribed beta-lactam antibiotic in 9 countries, phenoxymethylpenicillin in 3 countries (Germany, Sweden and Denmark) and a cephalosporin in Greece (Table I). In Austria, Finland, Germany and Italy, a macrolide was prescribed more often than extended-spectrum penicillin.

Greece and Spain (0.53 and 0.52, respectively) had the highest ratio of amoxicillin in combination with clavulanic acid to amoxicillin alone and Finland and Germany the lowest (0.1 and 0.06, respectively). Seven countries had an increased ratio in 1997 compared to 1994.

Spain had the highest number of macrolide prescriptions per 1,000 inhabitants and Greece the highest number of lincosamide (J01F F) prescriptions per 1,000 inhabitants (Table I). All countries except for Sweden and Spain had an increased number of macrolide prescriptions in 1997 compared to 1994. Erythromycin was preferred by Sweden and the UK, azithromycin by Finland and clarithromycin by Italy, Spain, Belgium, Portugal and Austria (Fig. 2).

Finland had the highest number of prescriptions of trimethoprim, either alone or in combination, per 1,000 inhabitants, followed by Germany and Portugal.

Cephalosporins were extensively prescribed in Greece (501 prescriptions/1,000 inhabitants), France (249) and Italy (232), in contrast to the prescribing patterns in The Netherlands and Denmark (4 and 1 prescriptions/1,000 inhabitants, respectively) (Table I, Fig. 3). Parenteral cephalosporins were often prescribed in Italy, Spain, Greece and Belgium.

Spain had the highest number of quinolone prescriptions per 1,000 inhabitants and Denmark the lowest (range 13–136). Ciprofloxacin was the most used quinolone in Italy, Spain, the UK and Portugal, ofloxacin in Germany and norfloxacin in Sweden, Austria, Greece and France.

DISCUSSION

This study showed wide variations, both in terms of the number of prescriptions per 1,000 inhabitants and in the preference for different antibiotics, between the 13 European countries studied. There was a trend towards an increased number of prescriptions per 1,000 inhabitants in the countries of Southern Europe. When comparing neighbouring countries, major differences were evident, for example those between Belgium and The Netherlands. It seems unlikely that these large differences between countries reflect differences in the morbidity from bacterial infections and other explanations must be sought.

Studies have shown that the numbers of antibiotic prescriptions and the prescription patterns of GPs may differ between different countries as well as between individual physicians within a country (15–18). These differences may depend on several factors, e.g. differences in healthcare systems, antibiotic dosage regimens, patient expectations and attitudes towards taking drugs and in the sources of information available to general practitioners and the knowledge of GPs. It has been suggested that the differences in antibiotic usage in Western Europe may be primar-

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Fig. 1. Number of antibiotic prescriptions per 1,000 inhabitants in 13 European countries in 1994 and 1997.
Table I. Number of antibiotic prescriptions per 1,000 inhabitants per antibiotic ATC group in 13 European countries in 1997. In the group J01X (Other antibacterials) a small number of amphenicol prescriptions (J01B) were registered, together with glycopeptide antibacterials (J01X A), polymyxins (J01X B), steroid antibacterials (J01X C), imidazole derivatives (J01X D) and other antibacterials (J01X X)

<table>
<thead>
<tr>
<th>Country</th>
<th>Greece</th>
<th>Italy</th>
<th>Netherlands</th>
<th>Portugal</th>
<th>Spain</th>
<th>Sweden</th>
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<tr>
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<td>22</td>
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<td>57</td>
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<td>237</td>
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<tr>
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<td>229</td>
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<td>249</td>
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<td>501</td>
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* J01A = tetracycline; J01C = penicillins; J01C A = extended-spectrum penicillins; J01C E = beta-lactamase-sensitive penicillins; J01D A = cephalosporins; J01E A = trimethoprim, either alone or in combination; J01F = macrolides and lincosamides; J01F A = macrolides; J01F F = lincosamides; J01G B = aminoglycosides; J01M A = fluoroquinolones; J01X = other antibacterials. NA = not available.
Fig. 2. Numbers and types of macrolide prescriptions per 1,000 inhabitants in 13 European countries in 1997. For Denmark, both macrolides and lincosamides (J01F) are included. “Others” include spiramycin, midecamycin, pristinamycin, josamycin, rokitamycin and dirithromycin.

Fig. 3. Numbers and types of cephalosporin prescriptions per 1,000 inhabitants in 13 European countries in 1997. “Others” include cefatrizine, cefradine, cefalogidine, cefprozil and loracarbef.

ily explained by differences in healthcare systems and that the greater the number of physicians in a country, the greater the utilization of antibiotic drugs (15, 18). Cultural differences in perceptions and attitudes in the European countries may also add to the large variation in prescribing patterns (17). Antibiotics can, in some countries, be obtained at pharmacies without a doctor’s prescription, but data on the quantities of such sales are scarce (19, 20). As the IMS Health Global Services data were based on prescriptions, over-the-counter sales were by definition not included in this study.

In this study, the antibiotic data from Denmark and Sweden were based on all dispensed prescriptions registered at the pharmacies whilst the IMS Health Global Services data were based on a projection of a sample of all prescriptions issued. In addition to the methodological problems involved in the collection and projection of a sample, there may be differences between countries in terms of the pro-
portion of prescriptions actually presented at the pharmacies. However, in most countries the prescribing rates were similar for the 2 years studied, which may indicate that the sampling procedure was similar in each year. There was an increase in antibiotic prescribing between 1994 and 1997 in France and Greece and a decrease in Spain, Portugal and Sweden. As antibiotics can be acquired without a prescription in Greece, Spain and Portugal, the changes in prescription rates in these countries are difficult to evaluate. In Sweden, a reduction in prescribing has occurred following a national programme (21).

A recent study (22) showed that the highest antibiotic sales figures occurred in France, followed by Spain and Portugal, whereas the current study indicated that the highest use was in Greece, followed by Spain and Belgium. The slightly different results of these 2 studies may depend on the different measurements used (defined daily dose/1,000 inhabitants and number of prescriptions/1,000 inhabitants, respectively), on differences in data sampling methods or on different dosages and treatment durations.

Extensive antibiotic prescribing, as well as the use of different types of antibiotics, has been discussed as the major cause of the emergence and spread of resistance (23–25). Respiratory tract infections are the most common reason for an antibiotic prescription, the majority of which have a viral aetiology. The large variations in preferred drugs indicate differences in national recommendations, treatment traditions or different impacts of the marketing activities of the pharmaceutical industry.

Further studies are needed to compare the indications for antibiotic prescribing in different age groups, as well as dosages and treatment durations, in order to understand the large variation in usage. National treatment recommendations or guidelines should be developed, locally adapted, accepted and implemented.

In conclusion, this study indicates large differences in the number of antibiotic prescriptions per 1,000 inhabitants in a comparison of 13 European countries, both in terms of total numbers of prescriptions and per individual antibiotic subgroup. As the data collection method of the IMS Health Global Services was not fully transparent, it was not possible to judge the validity of their data. We would appreciate having the presented data challenged by data from the individual countries included in this study. All countries have an important role to play in ensuring that validated national and regional data on antibiotic prescribing and sales are made publicly available. Such data are needed in order to evaluate the impact of antibiotic prescribing on resistance, morbidity, complications and mortality.

ACKNOWLEDGEMENT

We acknowledge the financial support of the Swedish Network for Pharmacoepidemiology (NEPI). We are grateful for the statistical information provided by Helle Neel Jakobsen and Helle Landberger Johansen at the Danish Medicines Agency in Denmark.

REFERENCES


Submitted August 14, 2001; accepted December 7, 2001