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Brief report

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Antibiotic use in Barcelona in 2023 in primary care and the potential reduction by adjusting box sizes to current guidelines

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ABSTRACT

Introduction. Prior research has not examined the size of antibiotic packages prescribed. We assessed 2023 prescription rates in Barcelona and the most prescribed presentations in pharmacies, while evaluating potential reductions if all amoxicillin and amoxicillin/clavulanate containers had 20 doses.

Methods. Antibiotics prescribed by primary care doctors working for the Catalonian Health Institute in Barcelona in 2023 were analysed by calculating the defined daily doses per 1,000 inhabitants and day (DID).

Results. The observed prescribing rate was 8 DID, with penicillins accounting for 4.6 DID (57.2%). The most frequently prescribed antibiotics were amoxicillin and amoxicillin/clavulanate, making up 4.4 DID. If all the 30-dose presentations of amoxicillin and amoxicillin/clavulanate had been 20-dose containers, the total number of DIDs would have been 3.3, resulting in a reduction of 1.1 DID (25.4% less).

Conclusions. Antibiotic prescribing rate in Barcelona was low. Aligning the dosage of antibiotics with established guidelines could further reduce antibiotic consumption.

Key words: Antibacterial Agents; Primary Healthcare; Antimicrobial Stewardship; Package Size; Prescribing guidelines.

Uso de antibióticos en Barcelona en 2023 en atención primaria y reducción potencial ajustando el tamaño de los envases a las guías actuales

RESUMEN

Introducción. No se ha analizado hasta ahora el tamaño de los envases antibióticos. Evaluamos el uso de antibióticos recetados en Barcelona en 2023. Además, evaluamos la posible reducción en su uso si los envases de amoxicilina y amoxicilina + ácido clavulánico prescritos contuvieran 20 dosis.

Métodos. Se analizaron los antibióticos prescritos por los médicos de atención primaria en Barcelona pertenecientes al ICS en el año 2023, calculando la dosis diaria definida por 1000 habitantes y día (DHD).

Resultados. El uso total fue de 8 DHD, correspondiendo a penicilinas 4,6 DHD (57,2%). Los antibióticos más prescritos fueron amoxicilina y amoxicilina + ácido clavulánico, representando 4,4 DHD. Si todas las presentaciones de 30 dosis hubieran sido de 20 dosis, el número total de DHD habría sido de 3,3, con una reducción de 1,1 DHD (25,4% menos).

Conclusiones. El uso antibiótico en Barcelona fue bajo. Ajustar las dosis de antibióticos con las pautas establecidas podría reducir aún más su uso.

Palabras clave: Antibióticos; Atención Primaria; Programa de Optimización de Antibióticos; Tamaño de Envases; Guías de Prescripción.

INTRODUCTION

The prescription of antibiotics in Spain has been declining over the last years, with a significant drop when COVID-19 pandemic broke out and with a slight increase in the subsequent years. However, the amount of antibiotics prescribed in 2023 was lower compared to the last years of the prior decade [1]. Spain is currently the eighth country when it comes to the number of antibiotics prescribed [2]. This is the result of many antimicrobial stewardship programmes that have been running in the last years throughout the country and a deeper sensibilization of health care professionals regarding the global threat of antimicrobial resistance. Our group has been implementing antimicrobial stewardship programmes with a focus on promoting the use of first-line antibiotics for uncomplicated urinary tract infections, advocating for the use of 3g-single doses of fosfomycin, and we have started implementing pro-

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grammes for respiratory tract infections, promoting the use of narrow spectrum antimicrobials and shorter courses [3].

Primary care is responsible for about 80% of antibiotic prescriptions, and both respiratory and urinary tract infections account for more than two thirds of all antibiotic prescriptions globally [4]. Antimicrobial stewardship programmes are usually more focused on the choice of antibiotics and when these drugs could be averted, with less implementation of duration when these antibiotics are necessary. In our country, the two most common antibiotics considered first-line treatments for respiratory tract infections, amoxicillin and amoxicillin/clavulanate, are only available in boxes of 20 and 30 units, based on a 2012 resolution by the Spanish Agency of Medicines and Health Products [5]. However, there is a growing recommendation for shorter treatment courses for also respiratory tract infections, and current guidelines advocate for five to seven days of antibiotic treatment [6]. Despite this, no studies have assessed the prescription patterns of the various presentations of the most prescribed antibiotics in our country. This study aimed to assess the current prescription rates in Barcelona in 2023 and the presentations most frequently dispensed in community pharmacies. Additionally, we examined the potential reduction in prescription rates if all containers of amoxicillin and amoxicillin/clavulanate contained only 20 doses.

METHODS

Cross-sectional study carried out during the year 2023. We present the antibiotic prescriptions in the city of Barcelona, including all the 51 centres, encompassing primary care centres, primary care out-of-hours services, primary care sexual and reproductive services, and the home visit service, belonging to the Catalonian Institute of Health, which covers 75.5% of the population in Barcelona, based on data in 2023 [7]. Of the population living in Barcelona assigned to the Catalonian Institute of Health in December 2023, 52.2% were women, 20.3% were older than 65, and 11.5% were children.

We calculated the daily defined doses (DDD) and the DDD per 1,000 inhabitants and day (DID). The DID was calculated using the formula: DID = DDD * 1000 / (365 * 1,302,574) [8], where 1,302,574 represents the population living in Barcelona assigned to the Catalonian Institute of Health. We also determined how much the reduction in the DID would have been if all and 90% of the containers containing 30 doses of amoxicillin and amoxicillin/clavulanate were instead containers of 20 doses.

RESULTS

The observed prescribing rate was 7.999 DIDs. Among these, 4.576 doses were penicillins, representing 57.2% of the total. Macrolides were the second most frequently prescribed antibiotic family, with 1.063 daily defined doses, followed by quinolones and cephalosporins at 0.643 and 0.566 daily defined doses, respectively (Table 1).

The most prescribed antibiotics were amoxicillin and amoxicillin/clavulanate (2.487 and 1.887 DID, respectively), which in total accounted for 54.7% of all the antibiotics given. A total of 194,750 containers of amoxicillin and amoxicillin/clavulanate were prescribed, with 150,080 boxes designated for adults. Out of these, 119,866 presentations contained 30 doses (79.9%), while only 20.1% of the prescriptions were for boxes with 20 doses. As illustrated in Table 2, the combined DID for both antibiotics was 4.374. However, if all the 30-dose presentations had been 20-dose containers, the total number of DIDs would have been 3.260, resulting in a reduction of 1.114 DID (25.4% less). Considering a scenario where 90% of these 30-dose containers are replaced with 20-dose containers, allowing 10% of the two β-lactam presentations to be dispensed in 30-dose containers, the reduction would have been 1.035 DID. The majority of azithromycin presentations consisted of boxes containing three doses (64.5% of the total presentations), while fosfomycin prescriptions primarily involved single 3g doses of the antibiotic (58.7%).

DISCUSSION

The results of this study clearly indicate a low antibiotic prescribing rate in primary care in 2023—less than 8 DID—which is below the average antibiotic consumption in both Europe and other Autonomous Communities in Spain [2,9]. However, antibiotic use would have been significantly lower if all the prescribed box sizes of both amoxicillin and amoxicillin/clavulanate were containing twenty doses each. In addition, the antibiotic more commonly prescribed, amoxicillin, is the first-choice antibiotic in most of the common infections in our country [6,10]. This good choice is also shown with the most frequent prescription of 3g single presentations of fosfomycin, which is also considered as the first-line antibiotic for uncomplicated urinary tract infections.

Recent guidelines advise against prescribing amoxicillin and amoxicillin/clavulanate for respiratory tract infections for a duration of ten days, except in the case of streptococcal pharyngitis [6]. However, a ten-day course of narrow-spectrum antibiotics like penicillin V is recommended for this specific infection. Consequently, the availability of containers containing both amoxicillin and amoxicillin/clavulanate is not justified for any of the infections typically managed by a general practitioner. Some recent clinical guidelines, like the WHO AWaRe antibiotic book, advocate for even shorter durations, like five-day courses of antibiotics for acute rhinosinusitis, acute exacerbations of chronic obstructive pulmonary disease, and community-acquired pneumonia [10]. Despite this evidence, most clinicians still use standard or longer courses [11]. To adhere to these guidelines effectively, one approach is to reduce the number of doses in antibiotic boxes. Firstly, by discontinuing the availability of boxes containing 30 doses, and secondly, by aligning the number of doses with these updated guidelines, allowing a maximum of 15 doses per container of amoxicillin and amoxicillin/clavulanate. Policymakers play a crucial role in promoting the rational use of antibiotics, and it is vital to im-

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Table 1	Antibiotics prescribed in Barcelona in 2023 in primary care.

Anatomical Therapeutic Chemical Classification antibiotics	Number of boxes	DID*
J01A. Tetracyclines	11,284	0.506
J01C. β-lactam antibacterials, penicillins	211,750	4.576
J01CA. Broad-spectrum penicillins	124,786	2.488
J01CE. β-lactamase susceptible penicillins	9,572	0.111
J01CF. β-lactamase resistant penicillins	7,334	0.090
J01CR. Combinations of penicillins	70,058	1.887
J01D. Other β-lactams antibacterials, cephalosporins	5,849	0.566
J01DB. First generation cephalosporins	10,542	0.063
J01DC. Second generation cephalosporins	17,252	0.417
J01DD. Third generation cephalosporins	4,303	0.086
J01DE. Fourth generation cephalosporins	12	0.000
J01E. Sulphonamides and trimethoprim	6,223	0.197
J01EA. Trimethoprim	57	0.000
J01EC. Sulfadiazine	40	0.001
J01EE. Cotrimoxazole	6,126	0.196
J01F. Macrolides, lincosamides and streptogramins	90,673	1.165
J01FA. Macrolides	82,171	1.063
J01FF. Lincosamides	8,502	0.102
J01G. Aminoglycoside antibacterials	1,165	0.001
J01M. Quinolones antibacterials	40,647	0.643
J01X. Other antibacterials	78,888	0.345
J01XC. Fusidic acid	175	0.001
J01XE. Nitrofurantoin	7,946	0.131
J01XX. Fosfomycin	70,767	0.213
TOTAL	474,285	7.999

DID=Daily defined doses per 1,000 inhabitants per day.

plement these changes. Our study shows that simply adjusting the prescription of β-lactams to containers with a maximum of 20 pills would be effective in reducing the DIDs to less than 7. Community pharmacies can exchange antibiotics prescribed as long as they have the same number of tablets per package but cannot give containers with a different number of doses. Another aspect that could be influencing this is that when searching for an antibiotic in the electronic medical history in primary care, the drop-down menu displays the different presentations of the antibiotics randomly, instead of first displaying presentations with fewer units.

This study has some limitations. This study consisted of a large population, including a whole city and all prescriptions dispensed by general practitioners, professionals working in out-of-hours centres, sexual and reproductive services, and a home visit service of a public healthcare service, thus providing a complete picture of overall antibiotic prescribing in primary care in the whole city. However, prescription of doctors belonging to other healthcare providers and private doctors were not considered in this study. We have focused our analysis only on the estimated savings of the two most common antibiotics, rather than all of them, allowing us to specifically evaluate the savings that can be achieved with first-line antibiotics for common infectious diseases in primary care. While we acknowledge the limitations of extrapolating the findings of this study to other regions in Spain, we do not consider the results would have been much different.

Although there may be bias in extrapolating findings from a single city to the broader Spanish context, our results also indicate an improvement in antibiotic prescribing practices over recent years. This improvement is characterized by a reduction in both inappropriate and excessive antibiotic prescriptions. However, to further enhance these positive trends, regulatory measures aimed at reducing the number of doses per antibiot-

Table 2 | **Number of amoxicillin and amoxicillin/clavulanate presentations prescribed, along with the resulting DID that would have been observed if the 30-dose boxes prescribed had instead been 20-dose boxes.**

Antibiotic presentation	Number of boxes dispensed	Sum of DDD	Sum of DID	Sum of DDD* adjusted to boxes with 20 doses in all cases	Sum of DID* adjusted to boxes with 20 doses in all cases	Sum of DDD** adjusted to boxes with 20 doses in 90% of cases	Sum of DID** adjusted to boxes with 20 doses in 90% of cases
Amoxicillin, 1,000 mg	15,905.00	283,233.33	0.596	212,066.67	0.446	219,183.33	0.461
Amoxicillin, 125 mg susp.	171.00	342.00	0.001	342.00	0.001	342.00	0.001
Amoxicillin, 250 mg	55.00	150.00	0.001	275,00	0.001	275.00	0.001
Amoxicillin, 250 mg susp.	39,370.00	154,800.00	0.326	154,800.00	0.326	154,800.00	0.326
Amoxicillin, 500 mg	42,127.00	392,980.00	0.827	280,846.67	0.591	292,060.00	0.614
Amoxicillin, 750 mg	27,064.00	350,645.00	0.738	270,640.00	0.569	278,640.50	0.586
Amoxicillin/clavulanate, 100 mg susp.	4,716.00	33,797.33	0.071	33,797.33	0.071	33,797.33	0.071
Amoxicillin/clavulanate, 125 mg susp.	116.00	232.00	0.000	232.00	0.000	232.00	0.000
Amoxicillin/clavulanate, 250 mg susp.	341.00	1,408.00	0.003	1,334.67	0.003	1,334.67	0.003
Amoxicillin/clavulanate, 500/125 mg	32,264.00	322,640.00	0.679	215,093.33	0.452	225,848.00	0.475
Amoxicillin/clavulanate, 875/125 mg	32,621.00	539,175.00	1.134	380,578.33	0.800	396,438.00	0.800
TOTAL presentations of both antibiotics	194,750.00	2,079,402.67	4.374	1,550,006.17	3.260	1,602,950.83	3.339

DDD=daily defined dose. DID=DDD per 1,000 inhabitants and day.

*These columns represent the potential DDD and DID if all the containers of amoxicillin and amoxicillin/clavulanate, originally prescribed with 30 doses, had been in presentations with 20 doses instead. For amoxicillin/clavulanate, the reduction in DDD would have been 266,216.67 DDD, and for amoxicillin, it would have been 263,179.99 DDD.

**These columns represent the potential DDD and DID if 90% the containers of amoxicillin and amoxicillin/clavulanate, originally prescribed with 30 doses, had been in presentations with 20 doses instead.

ic container or a move to an exact pill-count system should be implemented, as suggested by other studies [12,13].

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None to declare.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest

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