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Oral Antibiotic Prescription in Ambulatory Care in 1999 – A Contribution to the Development of Methods for Drug Consumption and Prescription Surveillance Monitoring

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A B S T R A C T

The aim of the study was to estimate the consumption of antibiotic in ambulatory care. Oral antibiotic consumption in 1999 was analyzed in four pharmacies in the Zagreb area. The use of oral antibiotics in comparison with total drug consumption, the share of individual subclasses of oral antibiotics and the respective shares of individual products were also analyzed. The results obtained were expressed in terms of both the defined daily doses (DDD) and US$, and were compared with available national and international data. The study demonstrated a high share of oral antibiotics in the overall drug consumption, especially of newer and more expensive agents within individual subclasses of antibiotics. Further research is required to assess the rationale of such prescribing practices, especially in view of the current financial pressure on the Croatian health care system.

Introduction

The governments of all countries, developed and developing alike make enormous efforts to rationalize health care provision and disease management with the aim of optimizing their respective health care systems.

As one of the most widely prescribed groups of drugs, antibiotics have been the topic of numerous medical and economic studies because of the relatively rapid emergence of bacterial resistance one the

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TABLE 1
ORAL ANTIBIOTIC CONSUMPTION IN ZAGREB IN 1999

	PHARMACY 1				PHARMACY 2				PHARMACY 3				PHARMACY 4			
ANTIBIOTIC	DDD	%	$	%	DDD	%	$	%	DDD	%	$	%	DDD	%	$	%
PENICILLINS	18260	55.67	15893.11	46.25	8633	50.26	7994.48	40.61	25443	68.44	18190.42	54.96	13948	49.70	12730.05	36.16
benzylpenicillin	4535	24.84	2134.51	13.43	1574	18.23	636.40	7.96	4225	16.61	2168.12	11.92	2400	17.21	1146.76	9.01
ampicilin	89	0.49	63.03	0.40	160	1.85	106.18	1.33	92	0.36	76.36	0.42	96	0.69	8.11	0.06
amoxicilin	6812	37.31	2387.53	15.02	3174	36.77	1107.27	13.85	14585	57.32	5178.71	28.47	3874	27.77	1357.28	10.66
amox/clav.acid	6824	37.37	11308.04	71.15	3725	43.15	6144.63	76.86	6541	25.71	10767.22	59.19	7578	54.33	10217.90	80.27
CEPHALOSPORINS	4321	13.17	8182.90	23.81	2182	12.70	4706.02	23.90	3760	10.11	7489.09	22.63	4080	14.54	11680.84	33.18
cephalexin	3193	73.89	4207.83	51.42	1299	59.53	1701.57	36.16	2704	71.91	3685.71	49.21	1916	46.96	2523.13	21.60
cefuroxime axetil	854	19.76	3160.97	38.63	663	30.38	2351.57	49.97	840	22.34	3162.02	42.22	1274	31.23	6519.65	55.81
ceftibuten	274	6.34	814.11	9.95	220	10.08	652.88	13.87	216	5.74	641.37	8.56	890	21.81	2638.06	22.58
MACROLIDES	2356	7.18	6198.63	18.04	1753	10.21	4654.89	23.64	1824	4.91	4535.77	13.70	2352	8.38	6188.83	17.58
erythromycin	180	7.64	181.36	2.93	112	6.39	112.85	2.42	312	17.11	314.34	6.93	172	7.31	116.90	1.89
azythromycin	21.76	0.92	6017.27	97.07	1641	93.61	4542.05	97.58	1512	82.89	4221.43	93.07	2180	92.69	6071.93	98.11
TETRACYCLINES	3135	9.56	409.93	1.19	1458	8.49	190.65	0.97	2022	5.44	264.39	0.80	2809	10.01	367.30	1.04
doxycycline	3135	100.00	409.93	100.00	1458	100.00	190.65	100.00	2022	100.00	264.39	100.00	2809	100.00	367.30	100.00
QUINOLONES	2417	7.37	2809.36	8.18	1250	7.28	1516.94	7.71	1550	4.17	1780.55	5.38	2405	8.57	3309.12	9.40
norfloxacin	2380	98.47	2724.36	96.97	1200	96.00	1373.62	90.55	1540	99.35	1762.66	99.00	1840	76.51	2106.14	63.65
ciprofloxacin	22	0.91	58.45	2.08	40	3.20	125.53	8.28	0	0.00	0.00	0.00	150	6.24	467.20	14.12
pefloxcin	15	0.62	26.54	0.94	10	0.80	17.78	1.17	10	0.65	17.78	1.00	415	17.26	735.78	22.23
CO-TRIMOXAZOLE	2103	6.41	601.49	1.75	1810	10.54	506.95	2.58	2485	6.68	711.72	2.15	2274	8.10	673.80	1.91
LINCOSAMIDES	206	0.63	268.84	0.78	90	0.52	117.29	0.60	94	0.25	125.01	0.38	194	0.69	252.63	0.72
clindamycin	206	100.00	268.84	100.00	90	100.00	117.29	100.00	94	100.00	125.01	100.00	194	100.00	252.63	100.00
TOTAL	32798		34364.26		17176		19687.22		37178		33096.95		28062		35202.57	
DDD avg. in $			1.04				1.14				0.89				1.25	
Drugs total			193848.07	17.73			106904.55	18.42			188420.27	17.57			247422.94	14.23
Prescriptions total			28415				15579				28245				36250	
Prescriptions avg. in $			6.82				6.80				6.70				6.82	

one hand and their high share in overall drug consumption on the other hand. In 1998 systemic antibiotics accounted for 8.5% of the 21,405 million US$ worth world drug market. The individual shares of the European, North American, Australian/African/Asian (A/A/A) and South American markets were 27.7, 34.7, 27.5 and 10.1%, respectively[1].

Patients and Methods

The study was conducted in four pharmacies in Zagreb providing services for approximately 20,000 clients, most of whom obtain their health care from 8 primary care practices. Four groups of prescriptions were analyzed, i.e. a total of 108,489 prescriptions given by primary

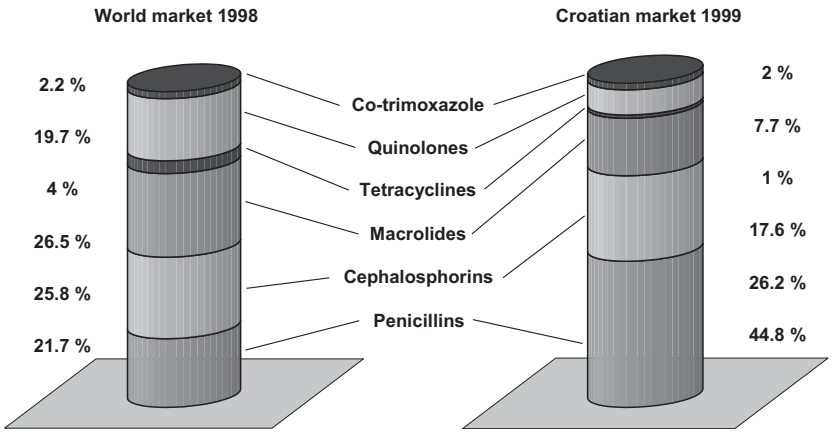

Fig. 1. Pharmaceutical market – share of systemic anti-infective agents by drug group ($%).

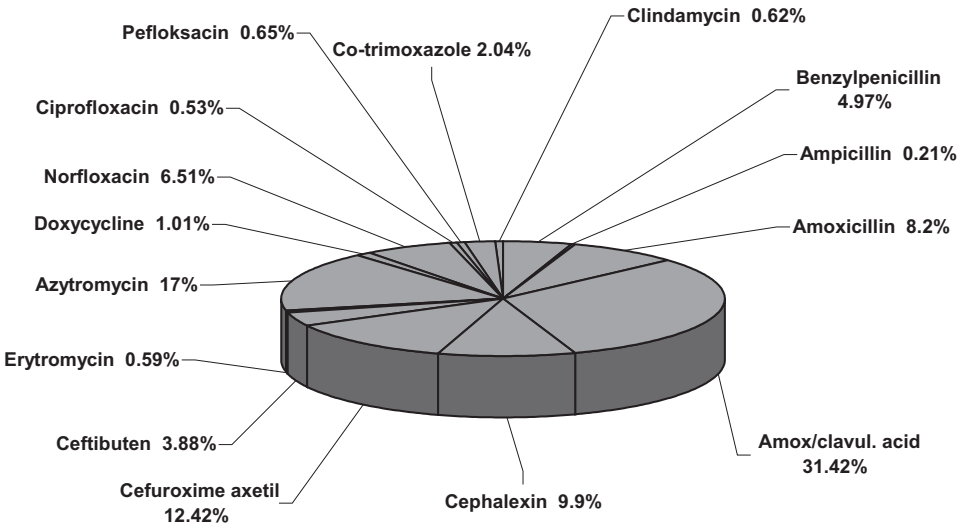

Fig. 2. Oral antibiotic consumption in Zagreb in 1999 expressed in US$.

TABLE 2
ORAL ANTIBIOTIC CONSUMPTION IN ZAGREB IN 1999

	DDD	%DDD	$	%$
Penicilins	66284	57.53	54808.05	44.80
Benzylpenicillin	12734	19.21	6085.79	11.10
Ampicillin	437	0.66	253.67	0.46
Amoxicillin	28445	42.91	10030.79	18.30
Amox/clavul. Acid	24668	37.22	38437.80	70.13
Cephalosporins	14343	12.45	32058.85	26.20
Cephalexin	9122	63.53	12118.23	37.80
Cefuroxime axetil	3631	25.32	15194.20	47.39
Ceftibuten	1600	11.16	4746.42	14.81
Macrolides	8285	7.19	21578.12	17.64
Erytromycin	776	9.37	725.45	3.36
Azytromycin	7509	90.63	20852.67	96.64
Tetracyclines	9424	8.18	1232.27	1.01
Doxycycline	9424		1232.27	
Quinolones	7622	6.62	9415.96	7.70
Norfloxacin	6960	91.31	7966.89	84.61
Ciprofloxacin	212	2.78	651.18	6.92
Pefloksacin	450	5.90	797.89	8.47
Co-trimoxazole	8672	7.53	2493.97	2.04
Lincosamides	584	0.51	763.76	0.62
Clindamycin	584		763.76	
Total	115214	100.00	122350.99	100.00
Drugs total		736596		16.61%
Prescriptions total		108489		

care physicians in 1999, amounting to an annual average of 5.4 prescription per patient (Table 1). The use of oral antibiotics in comparison with total drug consumption, the share of individual subclasses of oral antibiotics and the respective shares of individual products were also analyzed (Figures 1 and 2). The data collected were expressed in terms of both the defined daily doses (DDD) and US$[2]. The results obtained were estimated by comparing the respective prescription rates of particular antibiotic classes or individual agents against the guidelines for the rational use of drugs in outpatient clinics[2]. Furthermore, they were compared with available national and international data[1,3–5].

In addition to oral antibiotics, the analysis included co – trimoxazole as the only widely prescribed oral anti – infective agent.

To reject the impact of changes in drug prices, especially those resulting from the exemption of drugs from the VAT system, the drug prices in KN and the mean exchange rates valid on 31st December 1999 (1$ = 7.647 KN) were used in all calculations.

Results

Oral antibiotics account for 16.61% of the overall drug consumption in financial terms. In terms of DDD, penicillin's account for 57.53%, cephalosporins for 12.45%, tetracyclines for 8.18%, co – trimoxazole for 7.53%, macrolides for 7.19%, quinolones for 6.62% and lincosamides for 0.51% of the total consumption (Table 2, Figure 3).

When expressed in monetary terms, the shares of individual antibiotic Gasses produce a completely different picture: penicillins account for 44.8D%, cephalosporins for 26.2D%, macrolides for 17.64%, quinolones for 7.70% co-trimoxazole for 2.04%, tetracyclines for 1.01%, and lincosamides for 0.62% of the total consumption (Table 2 and Figure 2).

Analysis by individual antibiotic indicated that 4 major products accounted for 67.39% of the oral antibiotic market in monetary terms and 38% of the market in terms of DDD: amoxicillin/clavulanic acid (Klavocin®) with a share of 31.42%, cefuroxime axetil (Novocef®) with 12.42%, azythromycin (Sumamed®) with 17% and norfloxacin (Nolicin®) with 6.51% (Figure 2).

Analysis by prescription group revealed differences in the prescribing practices of individual physicians (Table 1). For a reliable conclusion, each group of prescriptions should be assigned relevant information about specific indications and susceptibility data from appropriate bacteriological studies. The analysis indicated that two packages sufficing for a 10 – day course of treatment were prescribed in 80% of cases.

Discussion

The results of the study demonstrated a high share of oral antibiotics in the overall drug consumption in ambulatory care in the city of Zagreb. These findings are consistent with the data published by IMS, currently the only organized system of drug consumption monitoring in Croatia[6]. A similar research conducted in France in 1996 revealed a significantly lower share of 7.7% total drug market in France[7].

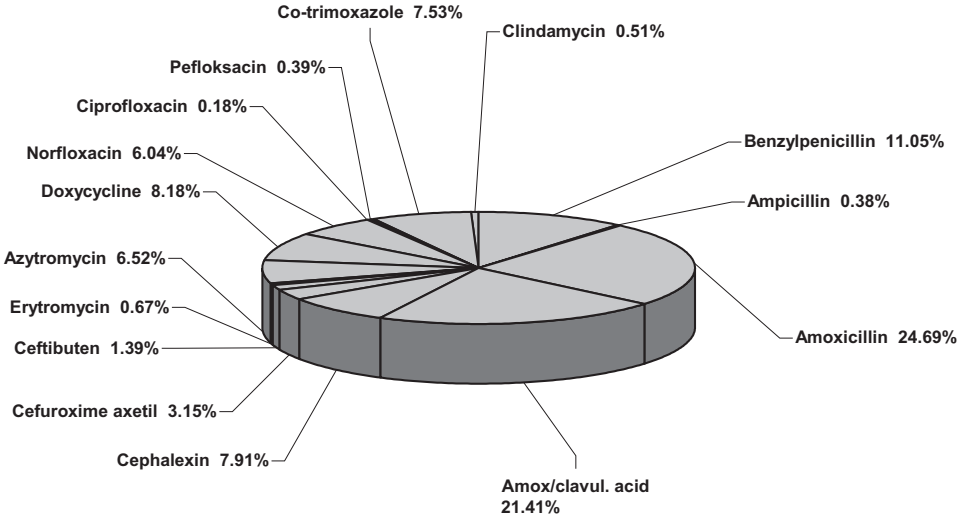

Fig. 3. Oral antibiotic consumption in Zagreb in 1999 expressed in DDD.

Systemic antibiotics account for 8.5% of the world pharmaceutical market and oral antibiotics for 66.4% of this figure, i.e. for 5.6% of the world market[1]. Analysis of drug consumption by antibiotic class revealed a significant difference between data expressed in terms of DDD and in US$ (Figures 2 and 3). The results obtained pointed to the frequent use of new and relatively expensive oral antibiotics in ambulatory care.

The four leading classes of antibiotics worldwide, i.e. penicillins, cephalosporins, macrolides and quinolones, have approximately equal shares in the world drug market (Figure 1). In the Zagreb area penicillins are significantly more often prescribed than either the macrolides or especially the quinolones (Table 2 and Figure 1).

Analysis by individual antibiotic indicated that the world's leading oral antibiotics, i.e. amoxicillin/clavulanic acid, cefuroxime axetil and azythromycin, had equally high shares in the overall drug consumption in Croatia, presumable because these products are manufacture locally by Pliva, Zagreb. Quinolones, except for norfloxacin, are somewhat less widely prescribed because they are not available on GP prescription. The serious economic problems faced by post-war Croatia have limited the use of imported drugs, especially when appropriate domestic alternatives were available.

In international terms the newer and more expensive oral antibiotics are more frequently used in developed Western European and North American countries, with quinolones and macrolides accounting for 68 arid 75% of the overall consumption worldwide. In less developed A/A/A and Latin American countries penicillins and first – generation cephalosporins are more widely prescribed, with co – trimoxazole and chloramphenicol accounting for 65 and 93% of the overall consumption worldwide[1,3–5].

While definitely not aiming at the level and quality of South American antibiotic prescription practices, Croatia still has to decide whether it can afford – in view of the current economic situation and heavily restricted health care budget – to adopt the high standards of modern Europe.

Analysis of prescriptions by primary care practice and pharmacy yielded the following pattern of antibiotic usage: among the penicillins as the most often prescribed group of oral antibiotics the number of prescriptions for amoxicillin and amoxicillin/clavulanic acid was approximately the same in two pharmacies, while ire the other two pharmacies either amoxicillin or amoxicillin/clavulanic acid Were significantly more often prescribed than other drugs (57.3% vs. 25.71% and 27.73% vs. 54.33%, respectively). A similar pattern was observed in the consumption of other newer and more expensive oral antibiotics, i.e. cefuroxime axetil, ceftibuten and azythromycin (Table 1).

Since all the four pharmacies studied are located in similar socio – economic environments in a relatively narrow geographic area, it is reasonable to assume that the differences observed are due to different prescribing practices of individual physicians rather than actual differences in indications, causative agents or relevant antibiotic susceptibility patterns. Of course, further research is needed to obtain a definite conclusion.

The results obtained stress the need for urgent reform the existing pharmaceutical sector in terms of both implementation of clinical and pharmaceutical guidelines, introduction of cost-control mechanisms based on sound and available evidence – based findings and cost effectiveness standards.

Furthermore, our study findings stress the need to stimulate both rational prescribing behavior of physicians in pri-

mary care, which is aimed at controlling the demand side of the antibiotic market, and to introduce mechanisms, which will stimulate the supply side of the market to reimburse drugs based on sound clinical and efficacy criteria.

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PROPISIVANJE ORALNIH ANTIBIOTIKA U AMBULANTNOJ PRAKSI U 1999. GODINI – DOPRINOS RAZVOJU METODA ZA PRAĆENJE I NADZOR POTROŠNJE I PROPISIVANJA LIJEKOVA

SAŽETAK

Istraživanje je provedeno u cilju utvrđivanja potrošnje antibiotika u ambulantnoj praksi. Analizirana je potrošnja peroralnih antibiotika u četiri ljekarne u Zagrebu u tijeku 1999. godine. Rezultati su prikazani u DDD-ima (definirane dnevne doze) i US$ te uspoređeni s dostupnim nacionalnim i međunarodnim podacima. Istraživanje je pokazalo visoko učešće peroralnih antibiotika u odnosu na ukupnu potrošnju lijekova, posebno novih i skupih antibiotika unutar pojedinih grupa antibiotika. Za procjenu opravdanosti takvog propisivanja, posebno s obzirom na ekonomsku situaciju u zdravstvu Hrvatske, potrebno je provesti dodatna istraživanja.