

Antibiotic Prescription and Consumption in Brazil: Impact in the Global Health

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1. Abstract

Despite the antibiotic sale prohibition without medical prescription since 2010, excessive and often inappropriate antibiotic prescription and self-medication, are still common practices in Brazil. Indiscriminate antibiotic use is directly involved with the dissemination of resistant bacteria causing serious infections increasingly difficult to treat. The present review work exposes data about the prescription and consumption of antibiotics in Brazil in the last decade and reveals a worrisome panorama about antibiotic use in the country.

2. Introduction

Antibiotics have been excessively and misused in human and veterinary Medicine and in agriculture. This use plus the globalization together have contributed to resistant bacteria dissemination that are easily transferred among people and animals and are rapidly spreading across continents. World Health Organization guidelines recommend farmers and the food industry stop using antimicrobials routinely to promote growth and prevent disease in healthy animals; the measure is important to maintain the effectiveness of antimicrobials used in antibiotic therapy of infections in humans and to contain the advance of antimicrobial resistance [1]. Conscious antibiotic prescriptions benefit inpatients and community. Evaluating and re-evaluating indication, dose, route, and duration

of antibiotic treatment, reviewing the patient's outcomes before switching the antibiotic and being attentive to antibiotic safety and efficacy, are examples of principles that must be adopted to reach an optimal prescription. If an antibiotic is prescribed inappropriately, it will likely be consumed wrongly; if used by self-medication, probably it will be consumed unnecessarily [2]. The present review shows data about antibiotic use in Brazil.

3. Methods

This review was performed to collect, select, and analyze data from articles published in MEDLINE, Scopus, Web of Science (ISI Web of Knowledge) and Science Direct, between 2011 and 2019. Keywords employed were that who best fit in the theme: antibiotic prescription, antibiotic consumption, indiscriminate antibiotic use, bacterial resistance, and Brazil. After the search, were select the papers directly related to the subject whose data were relevant and exposed the real situation regarding antibiotic use in Brazil. Finally, one references list of the original articles was completed and the articles were used to write the manuscript.

4. Results

Oral antibiotic sales data in the private sector in São Paulo state, from 2008 to 2012, showed a positive contribution to the Brazilian antimicrobial policy with the implementation of new resolutions that prohibited the sale of antimicrobials without retaining

a medical prescription, reducing antibiotic consumption. Oral antibiotic consumption was reduced from 8.44 defined daily doses per 1,000 inhabitants per day (DID) in 2008 to 8.06 DID in 2012 [3]. However, the fact does not seem to be repeated in other states of Brazil. Based on Brazilian studies, published between 2011 to 2019, is possible to affirm that Brazil has serious problems with the prescription and consumption of antibiotics. Unclear, illegible, and inappropriate antibiotic prescribing (unnecessary prescribing or wrong choice or dose and longtime of antibiotic use), were reported in all national territory, including in remote regions, such as the Amazon Basin [4]. In 18 private community pharmacies from Rio Grande do Norte, 29.3% of prescriptions had one or more illegible items, 91.3% had one or more missing items, and 29.0% had both illegible and missing items. Legibility of the antibiotic prescriptions interferes in the wrong antibiotic use. The evaluation was done between May and November 2014. Dosing schedule (18.81%) and patient identification (12.14%) were the most commonly unreadable items in prescriptions and the lack of complete patient identification occurred in 90.53% of the prescriptions. It is estimated that 40.3% of users have used antibiotics without a prescription and that 46.49% did not receive any guidance on the administration of the drug [5].

Insufficient prescription of antibiotics and the lack of patient guidance about how to use the drug was detected, when physician prescriptions in basic health units from Brasília, Campinas, Florianópolis, Minas Gerais, Porto Alegre, Salvador, and São Paulo were evaluated. Only 74.8% of antibiotic users (8,803) were correctly oriented about how to use the drug [6]. Analyzing antibiotic prescriptions to treat upper respiratory tract infections in Primary Health Centers of São Paulo state, over 12 months, about 13% of them occurred inappropriately to treat flu and other viruses. Penicillin (73.1%) was the most used antibiotic, followed by cephalosporins (10.6%), sulfonamides (7.5%) and macrolides (4.3%). Amoxicillin was the drug of choice for respiratory infections in pediatrics [7]. Overprescribing and inappropriate use of antibiotics in children has been reported in Brazil. A study by the Federal University of Rio Grande, conducted between May and December 2000, raised information about antibiotic use in 501 children in 18 community-based outpatient clinics of Rio Grande, Southern region of Brazil. Pieces of information were obtained through questions answered by the children's parents. About 201 (41.1%) children (29 days to 18 years of age) had received at least one antimicrobial course in the previous 2 months. For 7 months, the frequency of antibiotic use varied between once (41%) to three times (2.7%). Amoxicillin was the most used antibiotic (54%), but broad-spectrum antimicrobial agents were also used in 15.3% of interventions. Antibiotics were prescribed by a physician (96% pediatricians) to treat acute respiratory infections (91%), although at least 39.5 percent were conditions of presumed viral etiology [8].

Antibiotic consumption without prescription was described in a study that analyzed riverside dwellers more than 18 years old, in the Brazilian Amazon Basin, randomly selected, from April to July 2016. A total of 74 people (21.3% of 346) used an antibiotic and two-thirds of the patients managed to use the antibiotic without a medical prescription. Unfortunately, one-third of the antibiotics were used for non-bacterial infections [4]. About 20-50% of the world's population is affected by periodontal diseases. Frequently, in cases of dental emergencies, dentists or family doctors prescribe antibiotics, characterizing indiscriminate or over-prescription, since in many cases of dental outpatients, antibiotics use is unnecessary. Studies point out that antibiotics have been overprescribed in dental practices, contributing to the increase of antimicrobial resistance [9]. There are few works that discuss the indiscriminate use of antimicrobial agents in dental treatment, although self-medication has already been related in Brazilian literature [10]. In general, beta-lactams, macrolides, lincosamides and tetracyclines are the most prescribed drugs by dentists for treatment or prophylaxis, but in dental emergencies, the self-medication rates are alarming. A study showed that about 40% of 223 patients consulted in an Urgency Service of a Dental School in the South of Brazil for a period of two years, had taken antibiotics before the dentist's appointment and that 16% received a prescription after the consultation. Amoxicillin was the most frequently prescribed antibiotic [10]. Data about antibiotic prescriptions in Brazil are shown in (Table 1).

Self-medication and unnecessary antibiotic consumption have occurred in Brazil. A study based on data from the PNAUM (National Survey on Access, Use and Promotion of Rational Use of Medicines), showed a prevalence rate of 16,1% of self-medication in Brazil between September 2013 and February 2014. Of 8,545 drugs used in self-medication by Brazilian, 2.3% were antibacterial agents. When compared with analgesics (33.4%), although it seems low, the self-medication of antibiotics is unacceptable because their use without prescription can be life-threatening for the patient [11]. Of 136 adults that consumed antibiotics (one antibiotic per person), between May and August 2015, in the Metropolitan Region of Manaus, 19% used with no prescription, because self-medication or by recommendation of relatives, neighbors, or pharmacy employees. Cephalexin (39.7%) and amoxicillin (29.4%) were the antibiotics most used. There were 10 cases of self-medication with amoxicillin, six with cephalexin and four with tetracycline. Amoxicillin was the most self-medicated antibiotic, and consumption was higher among healthy women [12].

The habitual use of antibiotics among 655 residents of Goiás State, predominantly female between 20 and 59 years old, revealed that the main antibiotic indication was made by a physician or dentist (81.8%), while the other 18.2% were by a pharmacy employee or self-medication (9.1% each). The most used antibiotic was amoxicillin (40.1%), to treat infections of the oropharynx (29.5%), dental

issues (13.6%), or urinary/kidney infections (13.6%). About 5% of patients did not complete the treatment due to symptoms improvement, and the antibiotic inappropriate use to treat fever, influenza illness, or allergy; 20.5% of that people recommended the same antibiotic to family and friends [13]. Epidemiologic aspects related to antibiotic use were evaluated in 1,044 children of Pelotas, Rio Grande do Sul: only 45% had an antibiotic prescription. Children

with brown, yellow, or indigenous skin color had taken 2.5 times more antibiotics than white ones; children of mothers with 12 or more years of schooling used 83.0% fewer antibiotics than those of mothers with up to 4 years of schooling [14]. Relevant aspects associated with antibiotics consumption by the Brazilian population have been summarized in (Table 2).

Table 1: Antibiotic prescriptions data in Brazil

Place	N	Prescriber	Most prescribed Antibiotic	Prescription Indication	With prescription/ Self-medication	Reference
Primary Health Centers, SP	160	Physician	AMX (NR)	Pharyngitis (31.88%)	100%/NA	7
Households, AM	4,001	Physician	CEL (39.7%)	Respiratory I (NR)	81.8%/19%	12
Households visited, GO	655	Physician/ dentist	AMX (40,1%)	Oropharyngeal I (29.5%)	81.8%/9.1%	13
Five maternity wards, RS	1,044	Physician	NR	Respiratory I (60%)	44.8%/NR	14
Riverside-dwellers, AM	492	NR	AMX (27.3%)	Tonsillitis (NR)	33,8%/66,2%	4

N: Number of individuals studied. I: Infections. AMX: Amoxicillin; CEP: First-generation cephalosporins; CEL: Cephalexin; CEZ: Cefazolin. NR: not reported. NA: not applicable. GO: Goiás; RS: Rio Grande do Sul; SP: São Paulo; AM: Amazonas; SC: Santa Catarina

Table 2: Aspects associated with the consumption of antibiotics by Brazilian population.

Higher consumption by age group	N	Higher consumption by gender	Most used antibiotic	Consumption prevalence (%)	Clinical indication	State	Year	Reference
Children 0-9 years old	160	Female	AMX	100%	Pharyngitis	SP	NR	7
Adults 18-39 years old	492	Female	AMX	70,3%	Tonsillitis	AM	2016	4
Children 2 years old	1,044	Male	NR	10.50%	Respiratory I	RS	2015	14
Adults 20-59 years old	655	Female	AMX	6,8%	Oropharyngeal I	GO	NR	13
Adults 25-34 years old	4,001	Female	CEL	3.40%	Respiratory I	AM	2015	12

N: Number of individuals. AMX: Amoxicillin; CEP: First-generation cephalosporins; CEL: Cephalexin; CEZ: Cefazolin; NR: not reported. I: Infections. GO: Goiás; RS: Rio Grande do Sul; SP: São Paulo; AM: Amazonas; SC: Santa Catarina

5. Discussion and Conclusion

Unreadable prescriptions, prescriptions without guidance to the patient, underdosing, overdosing, and wrong or inappropriate prescriptions are examples of problems with the prescription of antibiotics in Brazil, reported in national studies. When the patient or pharmacist cannot clearly read what is written on the medical prescription, the chance of errors in consumption increases and in turn the improper use of the antibiotic as well [4,6].

The most frequent clinical indication for which antibiotics were prescribed and consumed by the Brazilian population was respiratory tract infections, although, in many cases, the infection may have been of viral origin [4,7,8, 12,13,14]. The mistaken use of an-

tibiotics to treat undetermined fever, viral infections and allergies and the recommendation of antibiotic use by family and friends based on symptoms and without a medical prescription are strong pieces of evidence of the indiscriminate use of antibiotics in Brazil. Antibiotic prescriptions to treat nonbacterial infections lead to unnecessary consumption of antibiotics [12,13,14].

In fact, the discrete reduction in antibiotic consumption observed in São Paulo state can be a positive consequence of Brazilian public policies measures by prohibition of the sale of antimicrobials without medical prescription but it was not seen in other Brazilian states and, therefore, it does not represent the Brazilian reality [3]. The consumption of antibiotics without a prescription is a

dangerous practice that carries serious risks to human health. In addition to the adverse effects that the antibiotic can cause in the patient, overuse can lead the patient to become ill from overdose, and underdoses can select resistant strains of bacteria among the sensitive ones impairing the treatment of a later bacterial infection. Amoxicillin was the most prescribed consumed, and self-medicated antibiotic in Brazil [4,7,8, 12,14]. This beta-lactam has been used to treat most community-acquired infections, and the isolation of Gram-positive and Gram-negative bacterial pathogens resistant to amoxicillin is very common in our midst [6]. Although most prescribers are physicians, dentists also have been reported as professionals who prescribe antibiotics very often in Brazil [9].

If urgent actions to alert people about the impact of inadequate prescriptions and of the indiscriminate consumption of antibiotics will not be taken and this practice is not interrupted, consequences to health human can be disastrous. Serious and resistant bacterial infections, difficult to treat, are already a reality in Brazil and around the world. From One Health perspective, antibiotic prescription and consumption cause a huge impact on human, animal, and global health. In fact, as the scientific literature has shown, all of us, animals, plants, microorganisms, and natural environments, are interconnected and interconnected, so that every action can impact and pose risks to the health of the entire globe. It is noteworthy that changes in any habitat, such as pollution by antibiotics or by antibiotic-resistant microorganisms, can influence the structures of their associated bacterial populations, contributing to the spread of antimicrobial resistance among the various terrestrial and aquatic [1]. Therefore, it is necessary to rethink surveillance and control measures in relation to prescription and consumption of antibiotics in Brazilian and world populations, both in Human Medicine and in Veterinary Medicine, in hospital or community environments, as well as in the management and disposal of these wastes in attempt to preserve human health and the whole planet.

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