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Ambulatory Antibiotic Consumption Profile: State of Play in a Pharmacy Store

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Abstract		Original Research Article

Introduction: Global consumption of antibiotics (ATBs) has increased by about 65% over the last 15 years. It was exponentially boosted in low and middle income countries. Bacterial resistance to ATBs is now one of the most serious threats to global health and is daily faced by all healthcare actors. In 2016, the World Health Organization (WHO) published an action plan to combat ATBs resistance, encouraging member states to develop their own national action plans. The objective of our study is to provide a state of the art reflecting the consumption patterns of ATBs in pharmacy stores. ***Material and methods:*** Our descriptive study lasted for 3 months and included all consenting patients presenting to a pharmacy of the city of Rabat (Morocco) for antibiotic treatment either on medical prescription, pharmaceutical advice or self-medication. The total number of included patients was 150. ***Results:*** Among 166 ATBs dispensed to 150 study patients, beta-lactam family represents the most consumed one with a percentage of 28,3%. In terms of delivery methods evaluation, 57.3% of ATBs were delivered on medical prescription, 37.3% on self-medication and 5.4% on pharmacist's advice. The most frequent reasons for ATBs use are skin infections, followed by ENT and pulmonary infections and most requested administration routes are oral and topical ones. ***Conclusion:*** In order to optimize ATBs use in ambulatory care, it is important to emphasize the key role of city pharmacist in compliance with the ATBs prescription and dispensing recommendations.
Keywords: Antibiotics, ambulatory use, bacterial infection, pharmacy store, survey, dispensing modalities, administration route, beta-lactams.

INTRODUCTION

Antibiotics represent a main therapeutic class used in both city medicine and hospitals. This class concerns a large number of prescriptions, prescribers, molecules and drug combinations. Moreover, it is the only class whose pharmacological efficacy is inconsistent for an identical target (the bacterium) and varies according to the time, the infected site and the geographical location (Planétoscope, 2022).

Today, bacterial antibiotics resistance is one of the most serious threats to global health. It is daily faced by all healthcare actors. It can affect anyone, at any age and in any country (Lorcy A *et al*., 2020; OMS, 2022). Global antibiotic consumption represented 42,3 billion doses per day in 2015 compared to 21,1 billion in 2000. Boosted by exploding consumption in low and middle income countries, global antibiotic consumption has increased by 65% in 15 years. This is the result of a study conducted on 76 countries, published in March 2018 in the American journal PNAS, which showed that "antibiotics remain a growing threat to global health".

Antibiotic resistance is increasing exponentially and therapeutic options are decreasing, as increasingly less new ATBs are placed on the market. Therefore, it is become important to protect the therapeutic efficacy of currently used ATBs (Mangin L, 2016).

In 2016, the World Health Organization (WHO) released its action plan to combat antimicrobial resistance, which includes antibiotic resistance. At the same time, it encourages each member state to develop its own national action plan, in accordance with goals of WHO global action plan, which identifies various strategic objectives (Lorcy A *et al*., 2020). In Morocco,

some important steps have been taken towards infection and resistance control, as well as towards the design and deployment of hospital antibiotic use surveillance. This is not the case for ambulatory antibiotic use and consumption for which it is constraining to identify priority problems and to assess the impact of potential interventions on antibiotic use and ultimately antibiotic resistance (Fortin É *et al.*, 2019).

In this context, the objective of our study is to draw up an inventory reflecting ATBs consumption profile in a pharmacy store.

MATERIAL AND METHODS
It's a descriptive study over a period of three-month between 12 January 2021 and 08 April 2021 during which we analyzed ATBs consumption patterns at a pharmacy store of Rabat city (Morocco), using a developed questionnaire with closed and semi-closed questions that provided information on patients profile (age, gender, allergy to ATBs), on the methods of ATBs dispensing (medical prescription, self-medication, Pharmaceutical advice), on the infection (in particular the infectious site) and finally on dispensed ATBs, including their International Nonproprietary Names (INNs), therapeutic family, galenical form and administration route.

The questionnaire analysis was carried out in two stages. First, a descriptive analysis was performed without data crossing (questions studied one after the other). The study population data was entered and analyzed by Microsoft Excel version 2013 spreadsheet and the results were presented in the form of percentages. Secondly, the data were cross-tabulated to obtain a more in-depth analysis and to highlight certain results.

In order to respect ethical considerations, we presented to the patients the study objectives and the interest of collected information, and then we asked for their consent before proceeding to data collection. Also, by concern with confidentiality and professional secrecy, each patient was identified by a number in order to respect anonymity.

RESULTS
1. Population information
Our study population included 150 patients with 166 antibiotic dispensations. The sex ratio M/F was 79/71 and the mean age of patients participating in the study was 39 years (+/- 19. 89) with age extremes of [2-81years]. During the study period, we found that ATBs consumption involved all age groups, with a remarkable increased consumption among patients whose age range is between 32-41 years, followed by those aged between 22-31 years (Figure 1).
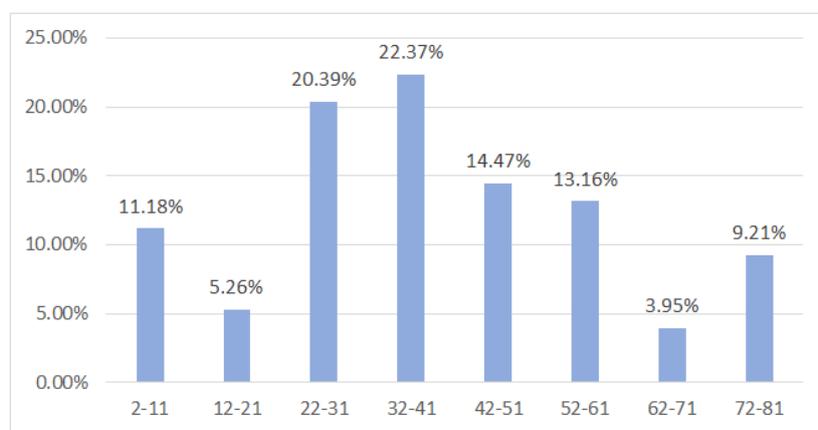

Fig-1: Distribution of patients by age (n=150)

Allergy to ATBs is very common, especially allergy to penicillin. In our study, 11.3% of patients are allergic to penicillin against 88.7% with no known allergy to ATBs.

80% of included patients were of Moroccan nationality against 20% that were foreigners. According

to data, 34.7% of the patients were regular customers of the pharmacy and 65.3% were passing customers.

Concerning the delivery modalities, most of the ATBs were dispensed on medical prescription, followed by those that were dispensed under self-medication (verbal request, drug package presenting, vocal or written message…), and those dispensed following pharmaceutical advice (Figure 2).
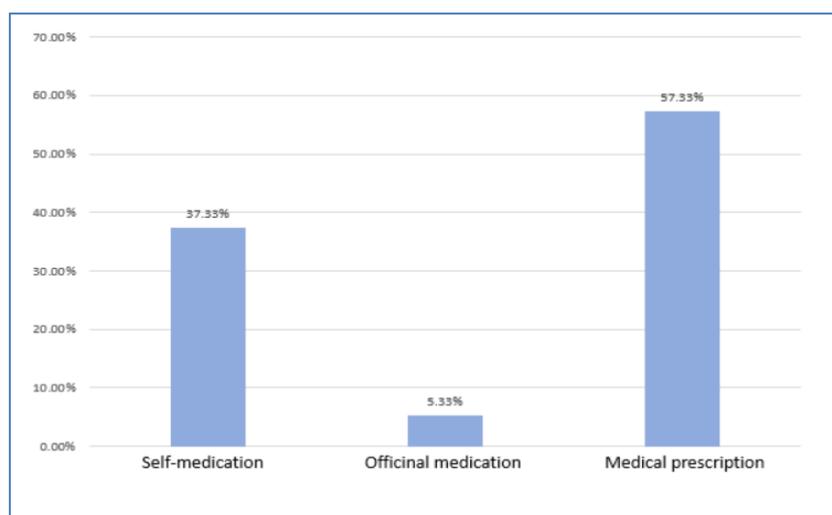
Fig-2: Distribution of the population by antibiotic dispensing modality (n=166)

2. Information on infection

Through data analysis, we noted that skin infections are in first place, followed by ENT infections (Ear, Nose and Throat infections) and pulmonary infections (Table 1).

Table-1: Antibiotic consumption by infectious site

Infection site	Number of patients	Percentage %
Cutaneous	41	**27,3%**
ENT	29	**19,3%**
Pulmonary	27	**18%**
Oral	17	11,3%
Eyepiece	15	10%
Urinary	14	9,3%
Gastro-intestinal	4	2,8%
Genital	3	2%
TOTAL	**150**	**100%**

Among all skin infections, the main reasons for antibiotic use ranged from simple wounds, whitlow, and acne, to skin cancer, as for ENT and lung infections (angina, sinusitis, otitis and Covid-19...) that were also frequent.

3. Data on antibiotic therapy

The total number of dispensed ATBs is 166 pharmaceutical specialties. These concerned 10 ATBs therapeutic families and 3 combinations of ATBs families. Consumption percentage for the different ATBs families is presented in the table 2.

Table-2: Ranking of ATBs consumed by the study population by antibiotic family

Antibiotic family	Number of patients	Percentage %
Beta-lactams	47	**28,3%**
Macrolides	29	**17,5%**
Fusidanins	26	**15,7%**
Quinolones	22	**13,3%**
Aminosides	11	6,6%
Cyclines	9	5,4%
Aminosides+polypeptides	5	3%
Imidazoles	5	3%
Macrolides+ Imidazoles	4	2,4%
Sulfonamides+diaminopyrimidine	3	1,8%
Synergistins	2	1,2%
Cytotoxic antibiotics	2	1,2%
Polymyxins	1	0,6%
TOTAL	**166**	**100%**

The 166 dispensed pharmaceutical specialties correspond to 31 INNs, including combinations of molecules. Among these, fusidic acid, azithromycin, protected amoxicillin (amoxicillin + clavulanic acid) and simple amoxicillin are the most frequently used ATBs as shown in Figure 3.
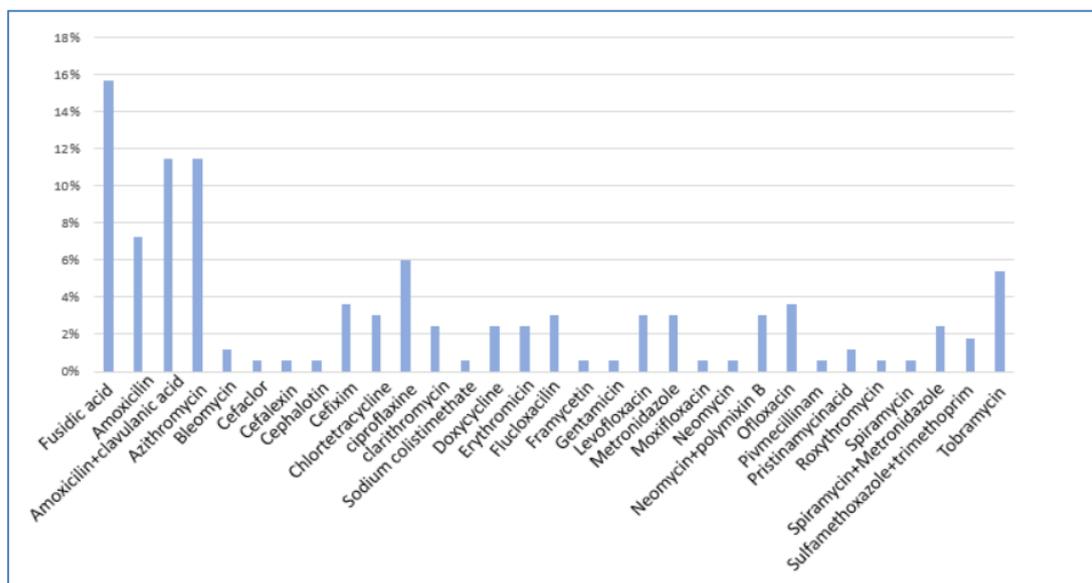

Fig-3: Distribution of the166 dispensed pharmaceutical specialties according to their INNs

Regarding administration routes, the oral and topical routes were the most requested by the studied population (Figure 4).
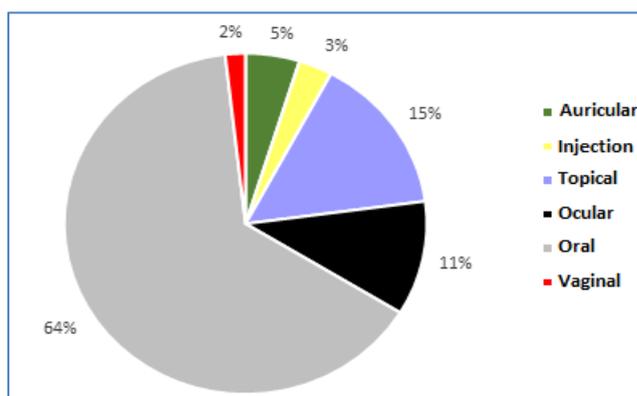

Fig-4: Dispensed antibiotics regarding their administration route (n=166)

The repartition of dispensed antibiotics regarding their galenical form is shown on Figue 5. Tablets represented the most requested galenical form followed by creams and dermal ointments.
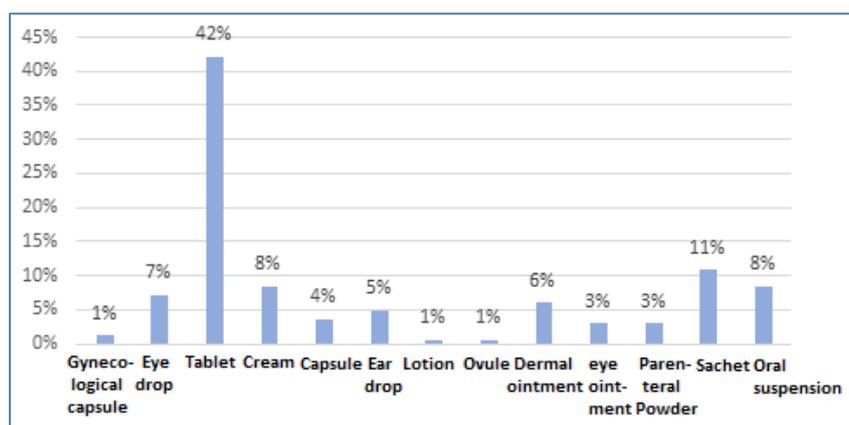

Fig-5: Dispensed antibiotics regarding their galenical form (n=166)

DISCUSSION

This study was conducted during the winter season while respiratory infections are at their peak. Therefore, the results cannot be inferred to the whole year because of seasonal fluctuations in infectious diseases. In addition, our results may be influenced by the epidemic peak of COVID-19 during this period, which resulted in the indiscriminate use of drugs such as Azithromycin and other ATBs.

In our country, few studies looking at the ambulatory ATBs consumption have been identified, among which, that carried out in Morocco by El Alj Y. in 2008 on the prescription of ATBs in ambulatory care. According to this study which included 505 cases, the modalities of ATBs delivery with the highest percentages concerned medical prescription (66.3% of ATBs) followed by self-medication (14,1%) (El-Alj Y, 2008). In the same sense, we reported in our study that the frequency of ATBs consumption under medical prescription is the most frequent with a percentage of 57.3% followed by self-medication in 37.3% of cases.

The high frequency of ENT and pulmonary infection sites (37%) in our study is also reported in the work carried out on the ambulatory ATBs prescription in the city of Kenitra which showed that 39.6% of the consumptions concerned respiratory sites. However, the high percentage of cutaneous infectious sites (27,3%) reported in our study it is not consistent with the results obtained in the same study (10.7%).

Moreover, our study highlighted a large number of ATBs prescriptions known for generating bacterial resistance such as the beta-lactam family which was the most consumed (28,3%), with amoxicillin-clavulanic acid association and simple amoxicillin as main consumed molecules (11% and 7% respectively). Note also a high consumption of azithromycin (17,5%) concomitant with the epidemiological peak of covid-19, but also of fusidic acid (15,7%) and quinolones (13,3%). Finally, the consumption of colistin remains very low and represents 1%. This low consumption could be explained by the fact that it is an antibiotic that should be reserved for hospital use. This highlights the pharmacist's role in preserving the effectiveness of ATBs by rationalizing their use in patients, especially for this kind of therapeutic class.

These findings have also been made in several countries with some variations. In France, for example, and following the report carried out by the National Agency for the Safety of Medicines and Health Products in 2015 on the consumption and resistance to ATBs, it was found that, in ambulatory human health, beta-lactams are among the most consumed molecules, with amoxicillin accounting for 37.6% of ATBs consumption, and the combination of amoxicillin and clavulanic acid accounting for 24.1%. The share of fluoroquinolones concern 5.4% of ambulatory consumption, which represents almost half of what was revealed by our survey. Finally, regarding colistin, the consumption is about 0.1%, even lower than it is in our study (Maugat S *et al.*, 2016).

According to a cross-sectional survey conducted at pharmacies in five different regions of Morocco, most of the prescribed ATBs (93.6%) are used orally (Naji W, 2008). This is consistent with our results which show that oral ATBs are the most requested (67%) for their ease of use in the ambulatory context. The topical route takes the 2nd rank with a percentage of 15%, in contrast to the study conducted in Kenitra which indicates a percentage of 2.2% of ATBs used by dermal route (El-Alj Y, 2008).

Moreover, the results of our work show a consumption of 43% of ATBs in tablet form among all oral routes. This agrees with Kenitra study which reveals that 46.9% of consumed ATBs were tablets.

Our study, as well as other published studies on the subject, shows that the pharmacist plays a very important role in the rationalization of drugs use in ambulatory care, especially for ATBs whose misuse can cause bacterial resistance or even deadly therapeutic impasses. Due to his main mission which is the analysis of prescriptions, the element that highlights this activity is the pharmaceutical intervention. The latter can concern either the adaptation of the dosage, the adaptation of the duration of the treatment considered too short or too long, the adaptation of the administration route, the, going as far as to add, change or refuse a treatment after having informed the prescriber. It also concerns accompanying patients in understanding their prescription, in addition to the elaboration of a medication plan allowing the patient to ensure a good observance of his treatment.

CONCLUSION

Antibiotic treatment of bacterial infections has presented a real revolution since 1941. The golden age lasted half a century, during which infectious diseases were considered to be definitively defeated. However if, from the beginning, the emergence of bacterial antibiotics resistance was observed, we would be convinced for a long time that permanent innovation and invention of new molecules would always give us a head start in the war declared between man and bacteria.

Over the last twenty years, bacterial antibiotics resistance has become increasingly worrying. Having first affected hospitals, they then have spread to community environment. Effective ATBs are becoming scarce and the innovation that we thought would go on forever has slowed (Institut Pasteur, 2018; Trémolières F, 2010).

Today, if we want to escape the nightmare of a return to the pre-antibiotic era, we must set means to stop the spread of resistant bacteria by radically modifying our irresponsible way of wasting ATBs to preserve effective treatments against resistant germs of tomorrow.

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