CYPRUS JOURNAL OF MEDICAL SCIENCES

Original Article

DOI: 10.5152/cjms.2019.697

# Implementations Related to the Use of Antibiotics and Data Sources Used by Community Pharmacists in the Northern Cyprus

**Kaya Süer[1], Sanda Çalı[2], Aslı Aykaç[3]**

[1]Department of Infectious Diseases and Clinical Microbiology, Near East University, School of Medicine, Nicosia, Cyprus
[2]Department of Public Health, Near East University School of Medicine, Nicosia, Cyprus
[3]Department of Biophysics, Near East University School of Medicine, Nicosia, Cyprus

**ORCID ID of the author: A.A. 0000-0002-4885-5070.**

**Cite this article as: Süer K, Çalı S, Aykaç A. Implementations Related to the Use of Antibiotics and Data Sources Used by Community Pharmacists in the Northern Cyprus. Cyprus J Med Sci 2019; 4(1): 28-33.**

**BACKGROUND/AIMS**
As the bacterial resistance to antibiotics became one of the major problems in today's world, a solution to this problem is possible through a common awareness of the doctor who prescribes antibiotics, the pharmacist who sells them, and the patient who consumes them. The aim of this study was to determine the sales ratio of non-prescription antibiotics in pharmacies, which is the most common category of the sold antibiotic group according to the pharmacists' records due to the received prescriptions, and to detect the relationship between the resources of drug information and the sociodemographic data.

**MATERIAL and METHODS**
A total of 84 pharmacies out of 168 pharmacies located in the Northern Cyprus were included in the study with a 50% stratified systematic sampling.

**RESULTS**
This study was carried out in the first and the second trimester of 2014 (01 January-30 June), and the daily sale of antibiotics was found to be 41.5%. In addition, the most purchased antibiotics were discovered to be the penicillin with 76.2%, and on the other hand, the disease for which antibiotics were most commonly prescribed was found to be the upper respiratory tract infection with 86.9%. When the level of self-awareness of the pharmacists was examined, it was discovered that they were highly knowledgeable about drug indications, as well as their side effects.

**CONCLUSION**
The rate of the use and sale of non-prescribed antibiotics in the Northern Cyprus has been found to be at a higher level compared to the rates in many developed countries. According to the new legislation for 2016, the rate of the use and sale of non-prescribed antibiotics is expected to be decreasing in the future.

**Keywords:** Community pharmacist, sources of drug information, knowledge of drugs, Cyprus

## INTRODUCTION

As the bacterial resistance to antibiotics became one of the major problems in today's world, a solution to this problem is possible through a common awareness of the doctor who prescribes antibiotics, the pharmacist who sells them, and the patient who consumes them. The rate of non-prescribed sales differs from one country to another, and it is known that the worldwide rate of non-prescribed antibiotics sales from public pharmacies is approximately 50% (1-5). Except in the North America and countries in the Northern Europe, accessing non-prescription antimicrobial drugs is possible throughout the rest of the world. Studies in developed European countries, including the United Kingdom, where the use of antibiotics is under strict control, have shown that the use of non-prescribed antibiotics is 14%–37%. According to the same study, it was emphasized that 47% of the non-prescribed antibiotics were maintained from the public pharmacies.

The use of non-prescribed antibiotics arises substantially from the lack of laws and deficiencies in regulations, especially when the rates are compared between the developed and developing countries. The use of non-prescribed antibiotics in developing countries like Nigeria (76%) is high due to lack of laws and inadequate regulations (6-11). The main prob-

**Corresponding Author:** Aslı Aykaç
**E-mail:** asli.aykac@neu.edu.tr

**Received:** 25.10.2018
**Accepted:** 02.01.2019

lem that arises as a result of non-prescribed antibiotic use is increased antibiotic resistance, which triggers the existing problems (12). In addition, an increased cost of treatment and the side effects of the drugs are known to be important consequences of the non-prescribed antibiotic use (13).

The aim of this study is to determine the rate of the non-prescribed antibiotic sales in pharmacies, the mostly sold antibiotic group according to the pharmacists' records, and to detect the level of general knowledge as well as the self-assessment of pharmacists' own levels of knowledge; also the study intends to investigate the relationship between non-prescribed sales and the knowledge levels together with the use of data sources, if any.

## MATERIAL and METHODS

### Study Design

A list of 84 pharmacies out of 168 pharmacies located in the Northern Cyprus (Nicosia, Kyrenia, Famagusta, and Morphou) was obtained from the 2014 Turkish Medical Association Health Guide published by the Cyprus Turkish Medical Association. Those 84 pharmacies were selected according to the 50% stratified systematic sampling, and a questionnaire was distributed to all.

Necessary approval were received from the Near East University Medical Research Ethics Committee the pharmacists concerned were asked to fill out and sign a consent form by one of the researchers of the study, a specialist in infectious diseases and clinical microbiology, in the period from June to September 2014.

### Methods

The sociodemographic characteristics, non-prescribed antibiotics sold, the most sold antibiotic group, the data sources, and the self-declaration of their own levels of knowledge were included in the questionnaire. The self-assessed knowledge levels of the pharmacists were evaluated by the 5-pointLikert Scale, from *very poor* (1) to *excellent* (5). Data sources used by the pharmacists were the following: Vademecum, RxMediaPharma, British National Formulary (BNF), Drug information prepared by the Turkish Pharmacists Union (TEBRP), pharmacology books, colleagues, the Internet, lecture notes, and consulting colleagues and other professionals.

### Statistical Analysis

For statistical analysis, Statistical Package for the Social Sciences version 15.0 (SPSS Inc., Chicago, IL, USA) was used, and the chi-squared test was applied. A p-value <0.05 was accepted as significantly different.

## RESULTS

Considering the distribution of pharmacies in the Northern Cyprus, it can be seen that the most pharmacists are located in Nicosia (42.9%). A total of 86.9% of the pharmacists graduated in the Republic of Turkey, 67.9% received only a bachelor's degree, and 82.1% were female. In addition, 87.3% of pharmacists had been working as pharmacists for over 10 years (Table 1).

When asked if they gave drugs to patients without any prescription, 82 (97.6%) pharmacists replied yes. When the daily antibiotic sale rates were examined, it was determined that the pharmacists were selling more than 10 antibiotics per day. Pharmacists selling less than 10 antibiotics a day had an antibiotic prescription rate of 56.2%, while pharmacies selling more than 10 antibiotics a day had an antibiotic prescription rate of 67.5%.

The sale rate of penicillin-derived drugs was 76.2%, and the sale of penicillin among other antibiotic strains was identified as the most common drug. Moreover, it was found out that antibiotics have been used most often in the treatment of upper respiratory tract complaints 86.9% (Table 2).

Pharmacists' self-assessment of their own level of knowledge on drugs was investigated through the 5-pointLikert Scale. None of the questioned parameters were selected as *very bad* (1) (Figure 1). Generally, pharmacists had a positive view of themselves with regards to medical knowledge of antibiotics. Their strong areas were selected to be issues relating to indications and side effects. Pharmacists determined that they felt they were weak

**TABLE 1.** Sociodemographic Characteristics of Pharmacists

| **Parameters (n=84)** | | | | |
|---|---|---|---|---|
| Location | Nicosia | Kyrenia | Famagusta | Morphou |
| n (%) | 36 (42.9) | 16 (19.0) | 26 (31.0) | 6 (7.1) |
| Age in years | <50 | ≥50 | | |
| n (%) | 42 (50.0) | 42 (50.0) | | |
| Gender | female | male | | |
| n (%) | 57 (67.9) | 27 (32.1) | | |
| Educational level | BSc[a] | MSc[b] | | |
| n (%) | 69 (82.1) | 15 (17.9) | | |
| Country where the bachelor's degree was obtained | NC[c] | Turkey | UK[d] | |
| n (%) | 3 (3.6) | 73 (86.9) | 8 (9.5) | |
| Years of experience as a community pharmacist | <10 years | ≥10 | | |
| n (%) | 19 (12.7) | 65 (87.3) | | |

MSc[a]: Master of Science; BSc[b]: bachelor's degree; NC[c]: Northern Cyprus; UK[d]: United Kingdom

**TABLE 2.** Group of the Most Sold Antibiotics and Indications

| | **n** | **%** |
|---|---|---|
| *The group of antibiotics* | | |
| Penicillin derivate | 64 | 76.2 |
| Cephalosporins | 17 | 20.2 |
| Macrolides | 2 | 2.4 |
| Quinolones | 1 | 1.2 |
| *Indications* | | |
| Urinary tract infections | 5 | 6.0 |
| Dermatologicalinfections | 1 | 1.2 |
| Upper respiratory tract infections | 73 | 86.9 |
| High fever | 5 | 6.0 |

in the areas of pharmacological properties and drug interactions, again according to their own statements (Figure 1).

**TABLE 3.** Sources of Drug Information Used by Community Pharmacists (n=84)

| Sources of Drug Information (n=84) | n | % |
|---|---|---|
| Vademecum medication guide[1] | 74 | 88.1 |
| RxMediaPharma[2] | 31 | 36.9 |
| BNF[3] | 13 | 15.5 |
| TEBRP[4] | 4 | 4.8 |
| Pharmacologybooks | 19 | 22.6 |
| Colleague | 24 | 28.6 |
| Internet | 57 | 67.9 |
| Lecture notes | 12 | 14.3 |
| Otherhealth personnel | 13 | 15.5 |

Vademecum[1]: CD and book; RxMediaPharma[2]: source of drug information; BNF[3]: British National Formulary; TEBRP[4]: drug information prepared by the Turkish Pharmacists Union

When drug information sources used by pharmacists were examined, it was seen that the Vadamecum medical guide was the most frequently used printed (88.1%) information source, while the Internet took the second place with 67.9% (Table 3).

When considering the impact of the independent variable on the level of knowledge, it can be observed that indications, pharmacological properties, contra-indications, side effects, drug interactions, and warnings were not affected by the level of knowledge in specific situations or bioequivalence issues. The level of education affects the variable posology and the method of administration regarding the level of knowledge only. Nevertheless, those with a master's degree (Master of Science, MSc) evaluated their knowledge level as perfect compared to those without it (Table 4).

Statistically, there was no relationship between the use of Vademecum, BNF, TEBRP, RxMediaPharma, Internet, lecture notes, and consulting colleagues or other health personnel and the level of education. It was determined that pharmacology refer-

**TABLE 4.** Dependent Variables Affected by the Level of Education, Seniority, and the Age of Pharmacist

| | | | Level of Education | | | | |
|---|---|---|---|---|---|---|---|
| **Dependent Variable** | **BSc (n=69)** | **%** | **MSc (n=15)** | **%** | **Total** | **$x^2$** | **p** |
| Posology and the method of administration regarding the level of knowledge | | | | | | | |
| Excellent | 29 | 42.0 | 2 | 13.3 | 31 | | |
| Good and ↓* | 40 | 58.0 | 13 | 86.7 | 53 | 4.357 | 0.037 |
| Use of pharmacologybooks as a source | | | | | | | |
| Use | 14 | 20.3 | 7 | 46.7 | 21 | | |
| Not use | 55 | 79.7 | 8 | 53.3 | 63 | - | 0.048 |
| | | | **Seniority as a community pharmacist** | | | | |
| **Dependent variable** | **<10 years (n=21)** | **%** | **≥10 years (n=63)** | **%** | **Total** | **$x^2$** | **p** |
| Level of knowledge related to pharmacological properties | | | | | | | |
| excellent | 2 | 9.5 | 24 | 38.1 | 26 | | |
| good and ↓** | 19 | 90.5 | 39 | 61.9 | 58 | 6.016 | 0.014 |
| Use of RxMediaPharma | | | | | | | |
| Use | 12 | 57.1 | 20 | 31.7 | 32 | | |
| Not use | 9 | 42.9 | 43 | 68.3 | 52 | 4.308 | 0.038 |
| Use of lecture notes | | | | | | | |
| Use | 6 | 28.6 | 5 | 7.9 | 11 | | |
| Not use | 15 | 71.4 | 58 | 92.1 | 73 | - | 0.025 |
| | | | **Age** | | | | |
| **Dependent variable** | **<50 (n=42)** | **%** | **≥50 (n=42)** | **%** | **Total** | **$x^2$** | **p** |
| Use of lecture notes | | | | | | | |
| Use | 10 | 23.8 | 1 | 2.4 | 11 | | |
| Not use | 32 | 76.2 | 41 | 97.6 | 73 | 8.473 | 0.004 |
| Use of RxMediaPharma | | | | | | | |
| Use | 21 | 50.0 | 11 | 26.1 | 32 | | |
| Not use | 21 | 50.0 | 31 | 73.9 | 52 | 5.048 | 0.025 |

*Seven community pharmacists interpreted it as average (3), and one community pharmacist interpreted it as bad (2); therefore, those answers were added to the good (4) category
** Since 14 community pharmacists interpreted it as average (3), their answers were added to the good (4) category
MSc: Master of Science; BSc: Bachelor's degree

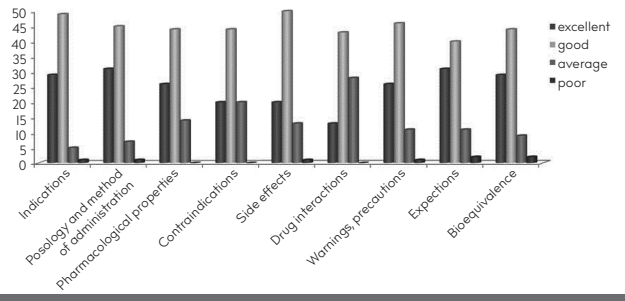


**FIGURE I.** Pharmacists' self-assessed knowledge of drugs

ence books were the only variable among the sources used to access the information that was affected by the level of education. It was clearly seen that the use of a pharmacology book as a source by pharmacists with a master's degree was twice as frequent as in those without it (Table 4).

The level of knowledge related to pharmacological properties seems to be only affected by the seniority as an independent pharmacy. According to the statements by the pharmacists who participated in the survey, there is a statistically significant relationship between the knowledge level regarding the pharmacological properties and the seniority as pharmacist. In pharmacists' own words, as the years of being in the independent pharmacy practice increase, the level of knowledge related to the pharmacological properties of drugs increases accordingly. Pharmacists who had been working as community pharmacists for a period greater than10 years evaluated their knowledge level regarding the pharmacological features as *perfect*, approximately 4 times higher than those who had been working as community pharmacists for a period shorter than 10 years (Table 4).

Statistically, no significant relationship was found between the use of Vademecum, BNF, TEBRP, the Internet, pharmacology reference books, and consulting colleagues or other health personnel and seniority as a community pharmacist. However, data indicated that there was a clear relationship between lecture notes and the use of RxMediaPharma with the seniority of community pharmacists. This revealed that the pharmacists who worked as community pharmacists for less than 10 years referred to RxMediaPharma and lecture notes as sources of information more than those with less experience in terms of the years of practice (Table 4).

The age group showed no major relationship between the use of Vademecum, BNF, TEBRP, the Internet, and pharmacology reference books and consulting with colleagues or other health personnel, yet there was a significant relationship between lecture notes and the use of RxMediaPharma with the age group. Lecture notes and RxMediaPharma were used more frequently by the pharmacists who were younger than 50 than those who were older (Table 4). According to pharmacists' own assessments, age had no effect on variables regarding the pharmacists' level of knowledge.

## DISCUSSION

Every country has its own national health system that reflects its history, economic development, and the political ideology within its territory. In this respect, it would be possible to say that there is no health system in the Northern Cyprus that could provide adequate basic health services and health insurance encompassing everyone (14). The rate of non-prescribed antibiotics purchased from public pharmacies is found to be 41.5% in the Northern Cyprus, compared with the studies conducted in Greece, Italy, Malta, and Spain (47%), and Egypt (50.4%) (15, 16).

If we consider countries such as Israel, with a rate of 4%, and Nigeria, with a much higher rate (76%), it would be possible to think that the type of health system in these countries that are welfare-oriented plays a significant role in providing more efficient health services (14, 17, 18).

In pharmacies selling less than 10 antibiotics (n=79), the sale rate of non-prescription drugs is 42.82%, and in pharmacies selling 10 antibiotics and more (n=5), the daily sale rate is 32.5%. This situation highlights that pharmacies that have existed for a longer time and selling 10 antibiotics or more have a greater reputation and have an established clientele of patients as customers.

According to the Malaysia Medical Statistics 2005, among the most widely prescribed drugs, the penicillin group of antibiotics came at the top with 47% (19, 20). In the study conducted in primary health care units in Malaysia in 2004 by Teng et al. (21), it was determined that 50% of antibiotics were prescribed for the treatment of upper respiratory tract infections. In another study, it was observed that amoxicillin, which is a derivative of penicillin, was prescribed for common cold at a rate of 54% (22). Similarly, in our study, we found that the most applied group of antibiotics in the first 6 months of 2014 were penicillin derivatives at 76.2% for the treatment of upper respiratory tract complaints at the rate of 86.9%. In this regard, the rate of prescription of penicillin in our research group was found to be more than one and a half times higher than the rate in Malaysia.

According to the data from the European Surveillance of Antibiotics Consumption (ESAC) Project carried out in 2003 and including25 European countries, the most used antibiotics for the upper respiratory tract infections is penicillin, which is derived from antibiotics (23). It has been reported that the most common causative agents of the upper respiratory tract infections are viruses, and even though it is a known fact that antibiotic treatment is has no clinical benefit in such cases, antibiotics remain overconsumed (24). The reasons for which the rates are so high in our study can be identified as prescribed and non-prescribed antibiotic sales. Moreover, when all types of penicillin derivatives are examined as a whole, we can also observe that doctors may prescribe antibiotics unnecessarily and that the pharmacists sell non-prescribed antibiotics. In France, one campaign aimed to reduce the use of antibiotics for upper respiratory tract infections across the country, which resulted in a 26.5% decrease in the use of antibiotics between the years 2002 and 2007 (25).

In the study conducted by Jawla et al. (26), which investigated data on drug interactions and drug dosages, it was specified that 73% of the pharmacists had information concerning drug interactions. The same study specified that 35% of the pediatric and geriatrics doses were calculated by pharmacists. A total of 66.7% of pharmacists in the Northern Cyprus assessed their level of knowledge on the drug interactions as *excellent* or *good*.

Pharmacists stated that they calculated the drug doses themselves in pregnant, pediatric and geriatric patients. And in the calculation of drug doses, 84.5% of the pharmacists stated that they were either excellent or good. Northern Cyprus pharmacists indicated that their knowledge about the side effects of the medication was *excellent* or *good* at the rate of 83.3% and as average at the rate of 15.5%. Chan et al. (13) stated in their study that 67% of the independent pharmacists specified the importance of having a place to get information about the adverse drug reactions, and 28% of them specified it as average. This result confirms our research concerning the self-confidence in the field of drug side effects.

In a study conducted in Hong Kong, the rate of independent pharmacists consulting pharmacist colleagues *very frequently* to get information on drugs was 14%, whereas *frequent* consultation remained at 38%. This method of access to information is lower in the Northern Cyprus (28.6%) (21). Chen et al. (13) reported that the rate of *very frequent* consultation of other health personnel was at 5% and *frequent* consultation was at 13%. Independent pharmacists consulting other health personnel in the Northern Cyprus had similar rates as the study in Hong Kong (15.5%).

Among the reasons as to why pharmacists have a higher preference for consulting other health personnel and pharmacist colleagues to access information rather than consulting Vademecum or the Internet, contrary to hospital pharmacists, are various issues such as the absence or restricted numbers of easily accessible doctors to consult, as well as their workload.

In addition, it would be possible to think that hospital pharmacists receive significantly different types of questions in terms of drug information from other health workers, whereas it is generally considered that answering questions from the community is the role of an independent pharmacist.

Answers to questions relating to renewed data sources by Jawline et al. (26) showed that 64% of pharmacists preferred books and magazines, 31% medical representatives, and 5% of the pharmacists stated that they used other sources.

The Vademecum medical guide was determined to be the first data source at 88.1% compared to the books and magazines used by the Northern Cyprus pharmacists as a source of information. The study determined that the utilization rate of the BNF in the Northern Cyprus is (15.5%), contrary to the rate of BNF used at a rate of 67% in the Northern Cyprus (13). In the study conducted in Hong Kong, the use of Goodman and Gilman's *The Pharmacological Basis of Therapeutics* book as a source of information was 5%, compared to the use of pharmacology books in the Northern Cyprus at 22.6% (13). As the Internet is one of the easiest and fastest ways to access information in today's world, it appeared as the second most common source with 67.9% preferred by the Northern Cyprus pharmacists to access information. The majority of pharmacists in the Northern Cyprus work as independent pharmacists, and therefore journal and periodicals on pharmacy or pharmacotherapy sources are not easily accessible. Also, the use of sources such as the Internet and Vademecum medication guide instead of standard texts are more popular as they are considered to be updated and revised. Medical representatives rarely visit pharmacies in the Northern Cyprus because of the scarcity of population. For this reason, medical representatives are not seen as a drug information source in this country.

Pharmacists with an MSc degree evaluated their knowledge levels on posology and administrative methods as *excellent* at a low rate of 13.3% compared to those without the degree. This situation mostly depended on the increase of awareness with regards to education. As the seniority increases, the level of knowledge on the pharmacological features of drugs is thought to be increasing as well.

A limited use of RxMediaPharma as an interactive drug reference source by the pharmacists who are aged ≥50 years, as well as those with ≥10 years of experience as independent pharmacists, is thought to be due to the fact that RxMediaPharma is more up to date and hence may not be as known as the other reference sources.

We believe that pharmacists with an MSc degree using pharmacology books two times more frequently than those with a BSc degree are more likely to be effective in raising awareness due to the education they have received.

We discovered that independent pharmacists who are aged <50 years have worked as independent pharmacists <10 years use their lecture notes to access the information concerning drugs at a higher rate than the pharmacists whose work experience is ≥10 years and are aged ≥50 years. This is probably because young graduates keep and use their lecture notes and have up-to-date knowledge from their university course.

Unnecessary and excessive use of antibiotics creates a problem that is not simply a personal problem, but a global one. The problem primarily encompasses providing more effective health services, limiting doctor prescriptions of antibiotics, and preventing pharmacists from selling any kind of non-prescription antibiotics. Overuse and sale of antibiotics can be prevented by modifying and restricting the existing regulations and training the public (16, 17). Campaigns can be arranged as in France to reduce the inappropriate use of antibiotics throughout the country. Such a campaign could also aim at reducing the prescription of antibiotics by doctors, as well as veterinarians according to the updated guidelines by the country's surveillance results (14).

For pharmacies, the law that no antibiotics could be sold without a prescription came into force on April 1st, 2016. To determine the attitudes and behaviors of pharmacist in the sale of antibiotics in the Northern Cyprus, new studies should be conducted to compare the pre- and post-law conditions.

Our findings signify the indiscriminate and high rate of antibiotic use in the Northern Cyprus. Considering a high number of students and tourists coming from various parts of the world to Northern Cyprus, it may be considered that the antibiotic resistance is effective in a much wider geographical area.

**Ethics Committee Approval:** Ethics committee approval was received for this study from the Ethics Committee of Near East University Medical Research Ethics Committee (Approval Date: 14.11.2013, Approval Number: NEU/2013/23/094).

**Informed Consent:** Written informed consent was obtained from the patients who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author contributions:** Concept - K.S., A.A.; Design - K.S. , S.C., A.A.; Supervision - K.S.; Resource - K.S.; Materials - K.S., A.A.; Data Collection and/or Processing - K.S., S.C., A.A.; Analysis and/or Interpretation - K.S., S.C., A.S.; Literature Search - K.S., A.A.; Writing - K.S., S.C., A.A.; Critical Reviews - K.S., S.C., A.A.

**Conflict of Interest:** The authors have no conflicts of interest to declare.

**Financial Disclosure:** The authors declared that this study has received no financial support.

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