

# STUDY OF AWARENESS OF PHARMACY EMPLOYEES IN UKRAINE WITH THE PROBLEM OF ANTIBIOTICS RESISTANCE

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## Abstract

Antibiotic resistance (ABR) is one of today's pressing challenges for scientists, healthcare, and pharmaceutical professionals. Pharmacies are often the first point of patient's contact with the healthcare system, so the pharmacist must be a source of objective information about ABR and provide qualified advice on prescription and over-the-counter medications.

**The aim:** through questionnaires to identify the level of knowledge about antimicrobial drugs of systemic action in pharmacists and pharmacists in Ukraine, as well as to monitor their behavior on the recommendations and release of antimicrobials without a prescription.

**Materials and methods.** The survey was conducted among pharmacy employees from May 1, 2019, to February 11, 2020. The questionnaire consisted of closed and open questions, multiple-choice, and comparison questions.

**Results** showed high self-esteem of knowledge about antibiotics among respondents, but their answers to open questions indicate a lack of knowledge. Most pharmacists are ready to recommend antibacterial drugs for colds and SARS, whooping cough, sore throat with fever, diarrhea. 69 % of respondents believe that a doctor should prescribe antibacterial drugs, but at the same time, 74 % of respondents do not always or never ask for doctor's prescription for antibiotics.

**Conclusions.** We believe that more articles on antibiotic resistance should be published for pharmacists in order to improve their skills. Issues on this issue should be more actively covered in the curriculum and the process of postgraduate education (training). Pharmacists should also be reminded of the possibility of prescribing over-the-counter medicines to help patients with SARS.

**Keywords:** antibiotic resistance, questionnaires, poll, awareness of pharmacists, over-the-counter antibiotics, antimicrobial agents of systemic action.

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## 1. Introduction

Antibiotic resistance (ABR) is one of the current challenges of modern scientists, medical and pharmaceutical workers [1, 2]. In recent decades, the number of infectious diseases caused by pathogens with multiple ABR has increased sharply worldwide [3, 4]. By 2060, the WHO predicts a significant increase in mortality from infections caused by multidrug-resistant microflora [5].

Of particular concern is the rapid spread of multidrug-resistant bacteria. Their detection has been reported from various countries, and for some of the multidrug-resistant microorganisms, there is still no effective treatment. Data from the European Antimicrobial Resistance Surveillance Network (EARS-Net) showed significant geographical differences in resistance levels to different classes of antibiotics. Higher levels of resistance are observed in Southern Europe due to higher levels of antimicrobial use. At the same time, there is a lower level of resistance in Northern Europe, which corresponds to lower antibiotic consumption levels [6]. A systematic review that included 57 studies showed that health professionals consider ABR a serious problem, but not in their immediate environment. The number of clinicians who regarded antibiotic resistance as a problem at the regional, national, or global levels was more significant than the number of health professionals who considered ABR to be a problem at the practice level [7].

Insufficient knowledge among medical and pharmaceutical workers is the reason for the irrational use of antimicrobials, which is the reason for the spread of ABR. Most European medical students surveyed in 2015 believe that they need additional education and knowledge on the use of antimicrobials for their further professional work [8].

A study conducted by the WHO in 53 European WHO member countries showed that pharmacists occupy the best position of all health professionals in the fight against ABR [9]. Pharmacies are often the first point of contact with the health care system, and counselling on symptomatic self-medication without antimicrobials is critical to help patients.

A study conducted in Portugal among pharmacists showed that a pharmacist's knowledge and attitude towards ABR could affect their propensity to dispense antimicrobials without a doctor's prescription. Pharmacists most often dispensed antibiotics without a prescription in cases of dental diseases (38.4 %) and urinary tract infections (36.2 %) [10].

WHO has developed a Global Plan of Action to address ABR. This plan consists of five points:

1. Improve awareness and understanding of microbial resistance to antibiotics;
2. To deepen knowledge through observations and research;
3. Reduce the incidence of infectious diseases;
4. Optimize the use of antimicrobials among humans and animals;
5. To develop economic justifications for sustainable investments in creating new antimicrobial drugs, diagnostic tools, vaccines, and the organization of other activities [11].

In Ukraine, all antimicrobial drugs of systemic action are prescription drugs. Their leave is regulated by the Order of the Ministry of Health of Ukraine No. 360 with changes and additions. The Order states that prescriptions must be prescribed for some categories of drugs [12]. According to the Code of Ukraine on Administrative Violations (Article 42), the release of medicines from pharmacies without a prescription entails a fine imposition. Repeated during the year of the violation provided for in part one of this article, for which the person has already been imposed an administrative penalty – entails the imposition of a larger fine [13].

Even high fines do not stop pharmacy workers in Ukraine from selling systemic antimicrobials without a prescription. The availability of antibiotics leads to the uncontrolled use of these drugs, which is a factor in the spread of antibiotic resistance. Pharmacy staff sells antibiotics without a prescription, which does not encourage the patient to see a doctor for a prescription for antimicrobial drugs of systemic action. And often, doctors write appointments on scraps of paper instead of prescriptions, which are not prescription forms. The pharmacist cannot check whether the patient has actually consulted a doctor and has a recommendation for a prescription drug. Also, there is a practice among doctors in Ukraine to prescribe medicines on a «list» of appointments – it can be an ordinary piece of paper from a notebook. The doctor writes a list of necessary drugs and the mode of their use. For the patient, such a «leaflet» is convenient because it has a «crib» for use, and for pharmacy workers, it can not serve as a document for release antibiotics from the pharmacy.

**The aim** is to identify the level of knowledge about antimicrobial drugs of systemic action and the problem of antibiotic resistance in pharmacists in Ukraine and monitor their behavior and justification for the release of antimicrobials without a prescription.

## 2. Materials and methods

The research was conducted by questionnaires of pharmacists (hereinafter – the respondents). The questionnaire consisted of closed and open questions, multiple-choice, and comparison questions. The complexity of the questions increased in order of increasing numbering. The questionnaire's primary purpose was to understand pharmacists' level of knowledge about antimicrobial drugs and assess the degree of their readiness to release these drugs only on prescription.

The general population of respondents in the study is the pharmacists of Ukraine. The sample was random and was conducted in different Ukraine cities among pharmacists who have been working in the pharmacy for more than six months.

Two hundred questionnaires were distributed. One hundred fifty-eight questionnaires were returned (79 %), of which 4 (2.67 %) were rejected due to incompleteness or corruption. One hundred fifty-four questionnaires were taken into the study.

The survey was conducted from May 1, 2019, to February 11, 2020, based on the National Pharmaceutical University of the Ministry of Health of Ukraine, Kharkiv.

### 3. Results

#### *I. Socio-demographic portrait of respondents.*

The study involved 138 (91.4 %) women and 13 (8.6 %) men. Three people decided not to indicate their gender.

Most respondents are young because they are better at contact and willing to devote their time to answering questions. The question «Specify your age» was answered by 151 respondents; three respondents did not indicate their age (**Table 1**).

All respondents answered the question, «Indicate the region where you have lived for more than 6 months during the year». All Ukraine regions were represented (**Table 2**), except for Khmelnytsky, Mykolayiv, and Ivano-Frankivsk regions, from where the questionnaires were not returned. The majority (45.45 %) of respondents represent the Kharkiv region, given the territorial location of researchers working in Kharkiv.

**Table 1**

Table of age distribution of respondents

Age, years	Number of respondents, persons	Respondents (%)
18–25	118	76.62
26–35	26	16.88
36–45	5	3.25
from 46	2	1.30
did not answer	3	1.95
<b>Total:</b>	<b>154</b>	<b>100.00</b>

**Table 2**

Areas of residence of respondents (more than 6 months per year)

No.	Region	Number of respondents, persons	Respondents (%)
1	Vinnitsia	2	1.30
2	Volyn	1	0.65
3	Dnipropetrovsk	11	7.14
4	Donetsk	8	5.19
5	Zhytomyr	2	1.30
6	Zakarpatska	1	0.65
7	Zaporizhzhia	1	0.65
8	Kyiv	1	0.65
9	Kirovohrad	5	3.25
10	Luhansk	3	1.95
11	Lviv	1	0.65
12	Odesa	3	1.95
13	Poltava	8	5.19
14	Rivne	2	1.30
15	Sumy	8	5.19
16	Ternopil	2	1.30
17	Kharkiv	70	45.45
18	Kherson	3	1.95
19	Khmelnitsky	2	1.30
20	Cherkasy	7	4.55
21	Chernivtsi	1	0.65
22	Chernihiv	5	3.25
23	Autonomous Republic of Crimea	1	0.65
24	Kyiv city	6	3.90
	<b>Total:</b>	<b>154</b>	<b>100.00</b>

*II. Professional skills of respondents*

Only 148 respondents (96.1 %) answered the question about work experience. The majority of respondents are young people with little experience in pharmacy (**Table 3**).

**Table 3**

Work experience of respondents

Experience in pharmacy	Number of respondents, persons	Respondents (%)
less than 1 year	20	12.99
1–5 years	117	75.97
6–10 years	7	4.55
11–20 years	4	2.60
did not answer	6	3.90
<b>Total:</b>	<b>154</b>	<b>100.00</b>

To the question «How often do patients go to the pharmacy to buy antibiotics?» the answer was given by all 154 respondents. Almost half of the respondents (44 %) face antibiotics in their practice every day (**Table 4**). Also, respondents stressed that in the autumn-winter period, patients are more likely to purchase antibiotics.

**Table 4**

Periodicity of patients' appeals to the pharmacy for the purchase of antibiotics

Periodicity	Number of respondents, persons	Respondents (%)
constantly (several times a day)	55	35.71
regularly (every day)	68	44.16
periodically	31	20.13
<b>Total:</b>	<b>154</b>	<b>100.00</b>

To the question «How often do patients appeal to buy antibiotics without a prescription from a doctor?» all 154 respondents answered. The answer «never» was not provided by any of the respondents (**Table 5**). Although orally, some respondents noted that a «letter of appointments» that a doctor can write on a notebook paper (rather than on a prescription form) is considered sufficient.

**Table 5**

Frequency of visits to the pharmacy without a prescription for antibiotics

Appeal without a prescription	Number of respondents, persons	Respondents (%)
Always	32	20.78
Often	103	66.88
Sometimes	14	9.09
Rarely	5	3.25
Never	0	0
<b>Total:</b>	<b>154</b>	<b>100.00</b>

Almost 30 % of respondents never ask for a prescription for an antibiotic, and nearly 26 % always ask for one (**Table 6**), although they may consider a «leaflet» of prescriptions as an official prescription.

**Table 6**

Respondents' answers to the questionnaire, «Do you require the patient to present a prescription when dispensing antibiotics?»

Answer	Number of respondents, persons	Respondents (%)
Yes, always	40	25.97
Yes, sometimes	69	44.81
No, never	45	29.22
<b>Total:</b>	<b>154</b>	<b>100.00</b>

The vast majority of respondents (75 %) indicated that patients sometimes turn to them for advice on antibiotics' choice and features (**Table 7**).

**Table 7**

Frequency of patients' appeals to the pharmacist for advice on the choice and features of antibiotics

Answer	Number of respondents, persons	Respondents (%)
Often	33	21.43
Rare	115	74.68
Never (please move to question 11)	4	2.60
Did not answer	2	1.30
<b>Total:</b>	<b>154</b>	<b>100.00</b>

The next question of multiple-choice was to determine which issues are most often consulted by pharmacy staff. Most respondents chose options related to the choice of antibiotic and its possible purpose (**Table 8**).

**Table 8**

Features of the antibiotic that pharmacists pay attention to during the consultation

Questions for consultation	Persons	%
the composition of the drug	56	37.8
dosage regimen, method of administration, duration of treatment	119	80.4
indications for use	105	70.9
contraindications for use	65	43.9
safety measures during use	39	26.4
symptoms of overdose, assistance in overdose	13	8.8
possible side effects when using the drug	55	37.2
interaction with other drugs and/or foods	57	38.5
features of the drug in pregnant women, lactating women, children, adults with chronic diseases	89	60.1
storage conditions	35	23.6
information about the manufacturer of the drug	21	14.2

The majority (84 %) of respondents rated their knowledge of the group of antibacterial drugs quite highly (**Table 9**). However, the questions concerning the pharmacological action and safety of drugs in this group were answered with significant errors.

**Table 9**

Assessment of their knowledge of antibiotics by pharmacists

Assessment of knowledge level	Persons	%
fully acquainted with the range and features of drugs	8	5.19
familiar with the range and features of most drugs	45	29.22
familiar with the range of the most commonly used tools and their main features	76	49.35
have an idea of some drugs from this group	22	14.29
practically unfamiliar with these drugs	2	1.30
did not answer	1	0.65
<b>Total:</b>	<b>154</b>	<b>100.00</b>

The majority of respondents (69 %) believe that a doctor should prescribe antibacterial drugs (**Table 10**). Still, at the same time, 74 % of respondents do not always or never require a doctor's prescription when asking pharmacy visitors before releasing antibiotics (**Table 6**).

**Table 10**

The attitude of respondents to the practice of selling antibiotics without a doctor's prescription, which has developed in our time

Answer	Persons	%
yes, consultation with a pharmacist when choosing an antibiotic is enough	18	11.69
yes, the pharmacist may recommend antibiotics in certain cases (specify below)	30	19.48
no, antibiotics should only be prescribed by a doctor	106	68.83
<b>Total:</b>	<b>154</b>	<b>100.00</b>

Of the 30 people who answered that a pharmacist might recommend antibiotics in certain cases, only 8 named such cases. Three answers refer to cases when the patient cannot get to the doctor due to the unavailability of the latter (vacation, small town, weekends, etc.). Two answers are related to specific diseases: SARS and dysentery. One respondent believes that if the patient had a positive experience of taking the antibiotic, the pharmacist might again recommend a particular antibiotic to the patient and, at the latter's request, to release it without a prescription.

Fifty-three percent (82 persons) believe that no antibiotics should be used during pregnancy, and 42 % said that some antibiotics are still possible. Only 49 respondents responded to the request to name examples of such antimicrobial drugs that can be used during pregnancy. Most said the potential benefits and risks to the mother and fetus should be considered. Most pharmacy workers who answered this question know that Penicillin drugs can be prescribed to pregnant women, but at the same time, there are many trade names and INNs of macrolide drugs, which may not always be prescribed during pregnancy.

To the open-ended question «What drugs of systemic action do doctors prescribe most often? (enter the name)» answered 117 respondents. Most of the drugs were listed under trade names and not by INN, which may indicate a not fully deep understanding of the groups of antibacterial drugs and insufficient knowledge of this group of drugs. Two respondents expressed the opinion that drugs are prescribed by a doctor depending on which drugs are «paid for» by a medical representative. Groups of drugs were also mentioned: carbapenems – 1 time, macrolides – 6 times, penicillin's – 5 times, and cephalosporins – 9 times.

The leaders in terms of doctors' appointments under trade names were: Azithromycin – 84 times and Amoxicillin (single drug and in combination with clavulanic acid) – 106 times.

Most pharmacists are ready to recommend antibacterial medicines for colds and SARS, whooping cough, sore throat with fever, diarrhea – in those diseases where antibiotics may not always be needed.

Analyzing the answers, we can see that pharmacists have an internal contradiction. 69 % of respondents are dissatisfied with the current practice in our country regarding antibiotics' issuance without a doctor's prescription. Still, at the same time, they release them without a doctor's prescription at their workplace.

#### 4. Discussion

A study conducted in March-April 2018 in Kharkiv (Ukraine) by researchers Berezhna A. V. and Chumachenko T. O. on the survey of medical students in graduate courses showed that survey participants make many mistakes in everyday life when using antibacterial drugs. However, all respondents are trained students who will start their medical practice after graduation [14, 15].

The survey of students of the Ukrainian Military Medical Academy in the first year of training of doctors of military training showed insufficient awareness of respondents on issues related to indications for use, the effects of antibacterial drugs, and the principles of rational antibiotic therapy with high self-esteem [16].

Our results of the pharmacists survey highlighted similar problems as among doctors and graduate students of medical faculties. Most appreciate their knowledge of antimicrobial drugs' pharmacological properties, but they may neglect expertise or have a much lower level in practice. It is possible to explain the following results by the Dunning-Krueger effect: less competent people overestimate the level of their knowledge and abilities [17].

The survey results confirmed the presence of problems in the work of pharmacists in pharmacies, which contribute to the development and deepening of the problem of ABR in Ukraine. The essence of the answers to the questions asked for pharmacy employees showed that it is necessary to train pharmacy students better and actively work on the topic of ABR in the process of postgraduate education.

Our research and research by other scientists have shown a «vicious circle»: doctors do not prescribe, and pharmacy workers release antibiotics to avoid losing the patient, while doctors do not prescribe because the patient can buy drugs at the pharmacy without prescription and so on.

To successfully combat ABR, a «team» must work: the State-Physician-Pharmacist, who will be able to prescribe antibiotics to patients and control this process rationally. Pharmacists, who are an integral part of this team, play an important role in combating antimicrobial resistance. Therefore, it is important to have a high level of awareness about antimicrobial drugs' effects and consequences [9, 18]. A pilot study of close collaboration between physicians and pharmacists in the correction of influenza and pharyngitis using rapid tests in the United States suggests this model's effectiveness. It can lead to smarter use of antibiotics and antiviral drugs, improve public health, and provide safe and convenient patient care [19].

A study of ABR awareness among Ukraine's population showed that pharmacists are not the main channel for obtaining information on this issue [20]. Therefore, we believe that pharmacists should devote more time to pharmaceutical care when dispensing antibiotics and become a source of reliable information on ABR for the public.

**Study limitations.** In some cases, wanting to appear more competent, respondents answer questions to which they do not know the exact answers. Or respondents try to «help» by answering the questionnaire in the way they think the researcher wants to hear.

**Prospects for further research.** Based on the study results, the team of authors plans to launch a number of publications in special periodicals. After some time, repeat the survey and assess the dynamics of changes in understanding the depth of the ABR issue and monitor changes in the behavior of pharmacists during the release of antibiotics.

#### 5. Conclusions

1. The majority of pharmacy employees (69 %) are dissatisfied with our country's current practice regarding the release of antibiotics without a prescription.

2. The majority of respondents (84 %) consider their level of knowledge about antimicrobial drugs to be sufficient. However, the answers to the questions indicate a lack of knowledge and ignorance about antimicrobial drugs' pharmacology. Also, some respondents avoided open-ended questions where they needed to demonstrate their knowledge.

3. Although most respondents say that it is unacceptable to release antibiotics without a doctor's prescription, when a patient goes to the pharmacy, they advise him on the choice and administration of antimicrobial drugs and release them without a prescription.

4. We believe that it is necessary to publish more articles for pharmacists in special periodicals to improve their skills in awareness of antibiotic resistance and the ability to recommend over-the-counter drugs to alleviate patients' well-being pharmacy visitors.

### Conflict of interests

The authors declare that they have no conflicts of interest.

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