

# Consumers' Psychological Perception of Antibacterial Drugs Use

Gulmira M. Muldaeva\*, Aizhan R. Beisenayeva, Almagul B. Kuzgibekova, Leila I. Arystan, Anel R. Beisenayeva and Leila S. Haydargaliyeva

*Department of General Medical Practice No. 2, Non-Profit Joint-Stock Company "Karaganda Medical University", 100000, 40 Gogol Str., Karaganda, Republic of Kazakhstan*

**Abstract:** *Objective:* The purpose of this article is to analyse consumers' psychological perception of antibacterial drugs use (ABD). For this purpose, the authors conducted a study in the form of a survey among patients, doctors and pharmacists.

*Background:* Currently, antibiotic resistance is increasing globally due to unreasonable prescriptions of antibacterial drugs. This issue is also urgent, as this method of treatment is the most expensive and common among patients.

*Method:* The main method of research in the article is a method of analysis and survey of general practitioners, pharmacists and patients in Karaganda.

*Results:* It was established that the majority of study participants acquired ABDs through doctors' prescriptions. The respondents aged 45 to 59 years are more reasonable in purchasing antibiotics. The results of the study also showed a low level of consumer knowledge of antibacterial drugs.

*Conclusion:* Therefore, the results of the study will be of interest to anyone who is interested in a reasonable prescription of antibacterial drugs, as well as in the reduction of their prescriptions.

**Keywords:** Antibiotics, treatment, prescription drugs, drug prescription, free purchase of antibiotics.

## INTRODUCTION

Currently, the growth of antibiotic resistance is a global problem. The urgency of this issue is associated with several important circumstances. First, antibacterial drugs (ABD) are among the most frequently prescribed drugs in outpatient practice [1] and are often prescribed unreasonably and without appropriate indications. Second, antibacterial therapy is a costly method of treatment, which constitutes up to 50% of the costs of medical institutions [2], and occupies a leading place in the cost structure of outpatients. It should be noted that the use of ABDs over time is associated with a decrease in their activity due to the formation of the resistance to them by microorganisms [3].

A prerequisite for successful antibiotic therapy is the complete eradication of the pathogen. When the treatment does not result in the complete elimination of pathogenic microorganisms, there is a "selection" of strains resistant to the drug used – resistance to antibiotics develops [4]. Extensive use of ABDs has become a catalyst for this problem. A strategic plan to control resistance to ABDs was established in the Republic of Kazakhstan for 2017-2019 in order to create ways to prevent resistance to ABDs, improve

the system of their reasonable use and reduce morbidity and mortality caused by infections [2].

The wide availability of ABDs, which may be bought without prescription, their "prophylactic" use in viral infections, wrong choice of antibiotics, their doses or duration of treatment and patient non-compliance with medical recommendations lead to the formation and spread of antibiotic-resistant strains of microorganisms, which today is a global problem for all countries worldwide [5]. It should be noted that errors in antimicrobial therapy have the largest proportion in the structure of all therapeutic errors made in outpatient practice. At the same time, prescription of wrong ABDs has a key effect on the outcome of the disease and economic component of the treatment, resulting in the selection of antibiotic-resistant strains of the pathogens [2].

In Kazakhstan, antibacterial drugs are used in 90% of cases, although only 5 out of 10 patients with acute respiratory viral infections require antibiotics, which is obviously due to insufficient knowledge of the aetiology of the disease, principles of appropriate antimicrobial therapy and self-medication due to the ability to purchase antimicrobial drugs without a prescription in the Republic of Kazakhstan. One of the significant problems of antimicrobial therapy is a common practice of using antimicrobial drugs without appropriate indications. According to pharmacy-epidemiological studies, prescription of antibiotics is unreasonable in

\*Address correspondence to this author at the Department of General Medical Practice No. 2, Non-Profit Joint-Stock Company "Karaganda Medical University", 100000, 40 Gogol Str., Karaganda, Republic of Kazakhstan; Tel: +77212414532; Fax: +77212413145; E-mail: t.volynets07@gmail.com

20-50% of cases, which is also typical for Kazakhstan [6].

According to the literature data, about 75% of episodes of ARVI, acute respiratory infections and influenza are treated by patients without doctor's advice. At the same time, 21% of the respondents decide to take antibiotics themselves [2]. The main psychological reasons for choosing self-medication can be:

- confidence in one's own knowledge of how and with what to be treated;
- distrust of medical workers;
- increased confidence in pharmacists;
- conviction in the effectiveness of drugs that were taken previously.

Patients are often sure that antibiotics are effective for cold symptoms (fever, runny nose, sore throat) and are the best remedy for such symptoms. The proportion of people who agree with such statements varies from 15% to 79%. Public opinion surveys show that 53.9% of patients (up to 73.5% in some countries) are convinced that antibiotics are effective against viruses as well as against bacteria. Often, antibiotics are used based on the advice of pharmacists, even though they belong to prescription drugs.

Numerous studies confirm the prevalence of this problem. In general, patient awareness of the problem of antibiotic resistance and the fact that they can contribute to its development through their actions is insufficient [7]. This situation worsened by the fact that many prescription drugs (including antibiotics) are actually available to consumers without a prescription [8]. The main factor for the purchase at the pharmacy, in this case, is the recommendation of the pharmacist who, compared to the doctor, is a more accessible specialist. When deciding on the purchase of a drug, the recommendations of a pharmacist become paramount for a change in initial request (buying prescription drugs, the patient acquires another drug in 20.2% of cases) [9]. The residents of Sweden, the Netherlands, Austria, Belgium and Hong Kong demonstrate the highest level of knowledge about antibiotics and the most reasonable attitude towards them [7].

In order to eliminate the problem of antibiotic resistance growth, free purchase of antibacterial drugs

in the pharmacies and patient self-medication, Order of the Minister of Health and Social Development of the Republic of Kazakhstan No. 713 of September 14, 2015 "On approval of the Rules for the wholesale and retail sales of medicines, medical devices and medical equipment" was issued, according to which antibacterial drugs are sold only on a doctor's prescription [10]. To ensure the appropriate use of antibiotics, it is necessary to increase the awareness of the population of self-medication in infectious diseases and increase the awareness of the pharmacists of ABDs, which requires a study of the ideas of the pharmacists and consumers of antibiotics and their use. The purpose of this article is to analyse the attitude towards prescription, dispensing and consumption of antibiotics at the outpatient level.

## MATERIALS AND METHODS

A survey of general practitioners, pharmacists and patients in Karaganda was conducted. The survey was conducted from January to March of 2018. The sample size was 150 subjects: 50 general practitioners, 50 pharmacists, 50 patients. Each questionnaire included 2 sets of questions. General questions were aimed at identifying the socio-demographic characteristics of the respondent (gender, age, education, marital status) and, when interviewing specialists, professional status (speciality/qualification, work experience). The block of special questions was aimed at identifying typical psychological behaviour of the respondent (frequency of purchasing/prescribing antibacterial drugs; conditions of purchase/prescription; factors which determine and limit the choice of the drug), as well as the respondent's ideas about the study drugs (range of used/recommended drugs, features of their administration, degree of their safety) [7].

The majority of the surveyed general practitioners are women (67.61-90.79%, CI=95%,  $\alpha=0.05$ ). Age: 26-65 years old (average age 44 years). Work experience: 1-39 years (average work experience 19 years). The overwhelming majority of the surveyed health professionals are women (80.47-98.13% (CI=95%,  $\alpha=0.05$ )). Among respondents, young people (24-35 years old) prevailed – 63.56-88.04% (CI=95%,  $\alpha=0.05$ ), the average age of health professionals was 41 years. The majority of respondents had secondary pharmaceutical education and pharmacist qualification (57.81-83.79% (CI=95%,  $\alpha=0.05$ )). The work experience of the respondents ranged from 0.5 to 35.5 years (average work experience was 18 years). Most of the respondents were persons with work experience of up to 5 years (43.9-72.1% (CI=95%,  $\alpha=0.05$ )).

To evaluate the knowledge of the characteristics of antibiotics, the respondents were offered 13 drugs and 13 characteristics, between which there was no direct correspondence (each characteristic could relate to one or several drugs). According to the objective assessment of doctors' knowledge of the properties of antibacterial drugs, including their safety, 18 respondents (22.29-49.71% (CI=95%,  $\alpha=0.05$ )) found the task very difficult and could not establish a single match. The rate of correct answers regarding individual characteristics did not exceed 34.71-63.28% (CI=95%,  $\alpha=0.05$ ).

Therefore, it can be stated that doctors in their practice regularly face the need to prescribe antibacterial drugs to patients, which implies knowledge of their features and established rules of prescription. Many doctors do not take the procedure for prescribing antibiotics seriously enough and do not consider it necessary to write prescriptions for such drugs. According to the results of self-assessment, doctors' knowledge of antibiotics is mainly limited to the most frequently used drugs. This data is confirmed by the results of the objective assessment of knowledge of the properties and safety of antibacterial drugs. The views on the toxicity of antibacterial drugs of the doctors interviewed generally reflect current data.

However, many respondents found it difficult to answer verifying questions and made major mistakes. Among those who completed the tasks, no more than half of the respondents succeeded, which indicates a serious gap in the knowledge among the specialists. The study results confirm the need to improve the professional knowledge of the doctors of the use of antibiotics.

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. A study was approved by the National Ethics Commission of the Ministry of Health of the Republic of Kazakhstan September 19, 2019, No 2585-L.

## RESULTS

Persons aged 25 to 44 years old accounted for 31.57-60.03% (CI=95%,  $\alpha=0.05$ ) of all participating visitors. The average age of participants was 36 years. In terms of gender among visitors, women prevailed (61.59-86.61% (CI=95%,  $\alpha=0.05$ ) of respondents), 13.39-38.41% (CI=95%,  $\alpha=0.05$ ) were men, as shown in Table 1. The number of surveyed visitors with higher education was 41.82-70.18% (CI=95%,  $\alpha=0.05$ ) of the total number of respondents.

**Table 1: Age and Gender Structure of Surveyed Visitors of Pharmacy Organisations**

Age, years	Gender				Total	
	Male		Female		Abs.	Rel., %
	Abs.	Rel., %	Abs.	Rel., %		
Below 25	32	4.2	142	18.2	174	22.4
25-44	91	11.7	267	34.1	358	45.8
45-59	66	8.5	133	17.1	199	25.6
60-74	7	0.9	30	3.9	37	4.8
75-89	4	0.6	6	0.8	10	1.4
Total	203	25.9	580	74.1	783	100

**Table 2: Structure of End-Users of Antibacterial Drugs by the Level of Education**

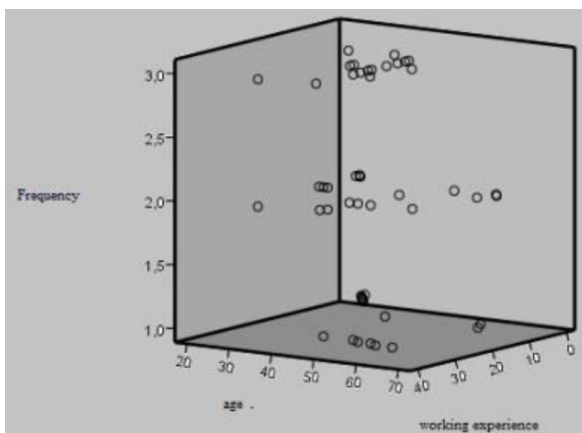
Education	Gender				Total	
	Male		Female		Abs.	Rel., %
	Abs.	Rel., %	Abs.	Rel., %		
Higher	118	15	321	41	439	56
Secondary special	64	8.2	167	21.3	231	29.5
Secondary	21	2.7	92	11.8	113	14.5
Total	203	25.9	580	74.1	783	100

Visitors of pharmacies with higher education accounted for more than half of the respondents (56%) (Table 2).

52.03-79.17% (CI=95%,  $\alpha=0.05$ ) of respondents were married, with 1 to 9 family members (Me=4 people). All the interviewed specialists prescribe ABDs for system use: 33.73-62.27% (CI=95%,  $\alpha=0.05$ ) – prescribe ABDs periodically, 14.32-39.68% (CI=95%,  $\alpha=0.05$ ) – daily, 12.63-37.37% (CI= 95%,  $\alpha=0.05$ ) – several times a day. The frequency of antibiotic prescriptions, depending on the age and work experience, is presented in Figure 1.

When prescribing ABDs, doctors most often pay attention to the indications for use (64.39-88.61% (CI=95%,  $\alpha=0.05$ )), dosing, route of administration and duration of treatment (55.01-81.59% (CI=95%,  $\alpha=0.05$ )), contraindications (42.55-70.85% (CI=95%,  $\alpha=0.05$ )). Only 36.92-65.48% of respondents took into account the peculiarities of ABD use in pregnant and lactating women, children, adults with chronic diseases (CI=95%,  $\alpha=0.05$ ) and possible side effects during administration (36.02-64.58% (CI=95%,  $\alpha=0.05$ )). They practically did not pay attention to: precautions (15.17-40.83% (CI=95%,  $\alpha=0.05$ )), overdose symptoms (6.27-27.73% (CI=95%,  $\alpha=0.05$ )) or information about the manufacturer (2.39-20.61% (CI=95%,  $\alpha=0.05$ )).

The pharmacy-therapeutic characteristics of the drug had the greatest significance for the choice of ABDs: efficacy (85.71-100% (CI=95%,  $\alpha=0.05$ )) and safety (85.71-100% (CI=95%,  $\alpha=0.05$ )). Affordability (62.63-87.37% (CI=95%,  $\alpha=0.05$ )) also affects the choice. The choice of the manufacturer and the brand (1.23-11.23% (CI=95%,  $\alpha=0.05$ )) is less significant. Packaging design does not affect the choice of antibiotics.



**Figure 1:** Frequency of antibiotic prescriptions depending on the age and work experience of general practitioner.

When prescribing ABDs, 44.21-72.39% (CI=95%,  $\alpha=0.05$ ) of doctors follow the treatment protocols approved by the Ministry of Health of the RK [11]; 27.61-55.79% (CI=95%,  $\alpha=0.05$ ) adhere to their own or traditional treatment regimens. Upper respiratory infections caused the administration of antibiotics in 35.12-63.68% (CI=95%,  $\alpha=0.05$ ) of cases and lower respiratory infections in 13.89-39.11% (CI=95%,  $\alpha=0.05$ ) of cases. Another significant cause was urinary tract infections – 0.14-15.46% (CI=95%,  $\alpha=0.05$ ) and gastrointestinal infections – 1.38-10.58% (CI=95%,  $\alpha=0.05$ ).

In Serbia, the doctors' compliance with the national guidelines was assessed. The average annual prescription of antibiotics was 188 7615, i.e. 54% of patients who sought advice. Acute respiratory infections, acute otitis media and acute tonsillitis accounted for 69% of prescriptions. Antibacterial drugs recommended for various nosologies were only prescribed in 1 to 17% of cases, so only 19-28% of prescriptions corresponded to clinical recommendations in the outpatient unit [12]. Spanish experts report that more than 50% of antibiotic prescriptions are inappropriate. In addition, in 35.2% of cases, a wrong antibiotic was chosen, and in 24.1% a wrong dose was recommended. The most frequent diagnoses with inappropriate antibiotic prescription were acute otitis media, Broncho-obstructive syndrome, fever without infection, acute tonsillitis and pneumonia [13].

In Jordan, in 69.2% of cases, antibiotics were prescribed without indications, with the majority of cases being respiratory infections of viral etiologic (78.4%) [14]. In the UK, during 2008-2010, oral antibiotics were recommended to 26.1% of patients, of which 77.4% were prescribed for respiratory infections, mainly acute tonsillitis, sore throat and acute otitis media. In this case, the authors emphasise that the main indication for the prescription of systemic antibiotic therapy was the diagnosis rather than real physical changes [15]. In Sweden, excessive prescriptions of antibiotics for acute respiratory infections and acute tonsillitis cause concern, as they account for the majority of excessive annual prescriptions [16, 17]. In America, it is estimated that tonsillitis ( $p<0.001$ ) is associated with enormous costs up to 1,685 dollars per child per year, i.e. about 1,355 billion dollars a year (2C) [18].

The analysis of medications prescribed by doctors (according to the survey) revealed that the majority of

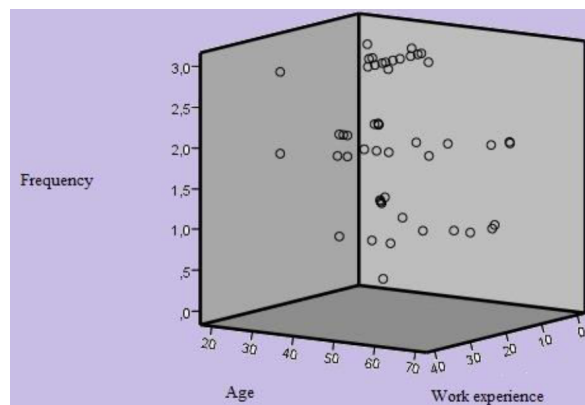
doctors use the drugs such as penicillins (68.82-91.58% (CI=95%,  $\alpha=0.05$ )), cephalosporins (77.0-96.4% (CI=95%,  $\alpha=0.05$ )), fluoroquinolones (46.11-74.09% (CI=95%,  $\alpha=0.05$ )) and macrolides (36.02-64.58% (CI=95%,  $\alpha=0.05$ )) in their practice. Aminoglycosides are mentioned by 34.22-62.78% (CI=95%,  $\alpha=0.05$ ) of the respondents and tetracyclines by 8.73-31.67% (CI=95%,  $\alpha=0.05$ ). The most commonly prescribed ABDs are amoxicillin + clavulanic acid (53.57-80.43% (CI=95%,  $\alpha=0.05$ )), amoxicillin (40.99-69.41% (CI=95%,  $\alpha=0.05$ )), ceftriaxone (33.14-61.66% (CI=95%,  $\alpha=0.05$ )) and azithromycin (28.19-56.41% (CI=95%,  $\alpha=0.05$ )).

According to the results of doctors' self-assessment regarding their knowledge of antibiotics, the following data was obtained: half of the specialists indicate that they are familiar with the most frequently used drugs on the market and their main features. 17.79-44.21% (CI=95%,  $\alpha=0.05$ ) of the respondents believe that they are familiar with the structure of the proposals and features of the majority of the drugs. 7.79-30.21% (CI=95%,  $\alpha=0.05$ ) of the respondents give a high rating to their knowledge of antibiotics, claiming that they are fully familiar with the structure of the proposals and the features of ABDs.

In Taiwan, after the start of periodic training of ambulatory specialists and their skill improvement, a significant decrease in the frequency of antibiotics was registered: from 28.4% in 2000 to 10.9% in 2009. The systemic antibiotic was prescribed to 16.8% of 40775 patients in 2009 [19]. In Sweden, after the mandatory qualification improvement of doctors, the number of antibiotic prescriptions decreased from 53.7% in 2008 to 45.5% in 2010 and to 38.6% in 2013 ( $p = 0.032$ ). In acute respiratory infections, this indicator decreased from 40.5% in 2008 to 24.9% in 2013, while it did not change in infections of the urinary tract, skin and soft tissues. Phenoxymethylpenicillin has become the most commonly prescribed antibiotic for acute tonsillitis. Thus, adherence to clinical recommendations regarding the choice of drugs for acute tonsillitis has improved [17]. In Serbia, a country with one of the highest rates of prescribing antibiotics, a decrease in the number of prescriptions up to 10% was also observed from 2011 to 2013 [12].

Almost all pharmaceutical professionals (92.13-100% (CI=95%,  $\alpha=0.05$ )) indicate that they face daily the sale of antibacterial drugs. At the same time, 38.74-67.26% (CI=95%,  $\alpha=0.05$ ) of the pharmaceutical professionals indicated that several patients come to

the pharmacy every day to buy antibiotics. Thus, the situation of the release of antibacterial drugs is typical in the daily work of a pharmaceutical specialist.



**Figure 2:** Frequency of antibiotic prescription depending on age and work experience of pharmaceutical professionals.

All pharmaceutical professionals face the patient's antibiotic treatment without a doctor's prescription. In the practice of a significant part of the respondents (64.03-88.37% (CI=95%,  $\alpha=0.05$ )), this situation often occurs. 21.92-49.28% (CI=95%,  $\alpha=0.05$ ) professionals indicated that patients always go to the pharmacy without a prescription to buy drugs of this group. 4.8-25.2% (CI=95%,  $\alpha=0.05$ ) of pharmaceutical professionals say that they sometimes face this problem, and only 2-6% (CI=95%,  $\alpha=0.05$ ) of the respondents face it rarely. The frequency of release of antibiotics, depending on age and work experience is presented in Figure 2.

Despite the patient's frequent apply for antibiotics, less than half of the respondents always require a doctor's prescription (30.79-59.21% (CI=95%,  $\alpha=0.05$ )). 34.72-63.28% (CI=95%,  $\alpha=0.05$ ) only sometimes clarify if the patient has a prescription for the drug. 1.1-11.7% (CI=95%,  $\alpha=0.05$ ) of the professionals never ask prescriptions for antibiotics from buyers. The majority of respondents (60.32-85.68% (CI=95%,  $\alpha=0.05$ )) state that antibiotics should be prescribed only by a doctor. 14.32-39.68% (CI=95%,  $\alpha=0.05$ ) respondents believe that a pharmacist can recommend antibiotics in some obvious cases. As examples of such cases, experts point out "the typical course of the disease", the patient has chronic diseases and the corresponding experience of the drug administration, a situation where the patient cannot visit a doctor (weekends, holidays, etc.). In addition, individual respondents specified "high fever for a week", "purulent tonsillitis", "catarrhal diseases", "cystitis, skin infections", "upper and lower respiratory tract diseases".

The most common reason for the purchase of antibiotics is infectious disease of the upper respiratory tract (26.92-71.88% (CI=95%,  $\alpha=0.05$ )), lower respiratory tract (6.65-46.35% (CI=95%,  $\alpha=0.05$ )), urinary system (4.26-19.86% (CI=95%,  $\alpha=0.05$ )) and gastrointestinal tract (4.82-14.02% (CI=95%,  $\alpha=0.05$ )). The frequency of the purchase of enteral forms of ABDs is 31.57-100% (CI=95%,  $\alpha=0.05$ ), and 46.23-100% (CI=95%,  $\alpha=0.05$ ) for parenteral forms. Combinations of amoxicillin with clavulanic acid (54.67-81.33% (CI=95%,  $\alpha=0.05$ )), ceftriaxone (51.37-78.63% (CI=95%,  $\alpha=0.05$ )), and amoxicillin (40.79-69.21% (CI=95%,  $\alpha=0.05$ )) were the most common prescribed products in most cases. In addition, the respondents observed a relatively frequent prescription of azithromycin (12.63-37.37% (CI=95%,  $\alpha=0.05$ )), ciprofloxacin (9.36-32.64% (CI=95%,  $\alpha=0.05$ )) by doctors. In general, macrolides (70.41-92.59% (CI=95%,  $\alpha=0.05$ )) and penicillin's 69.18-91.82% (CI=95%,  $\alpha=0.05$ ) are among the most commonly prescribed drugs.

Pharmaceutical professionals most often recommend amoxicillin in combination with clavulanic acid (41.82-70.18% (CI=95%,  $\alpha=0.05$ )), azithromycin (17.52-43.88% (CI=95%,  $\alpha=0.05$ )), amoxicillin (4.3-24.3% (CI=95%,  $\alpha=0.05$ )). In total, survey participants purchased 37 international non-proprietary names (INN) of antibacterial products for systemic use. Broad-spectrum antibiotics were purchased most commonly (Figure 3):

- penicillins – 5.67-26.73% (CI=95%,  $\alpha=0.05$ ) (6 INNs);
- cephalosporins – 7.72-30.08% (CI=95%,  $\alpha=0.05$ ) (7 INNs);

- macrolides – 3.74-23.26 (CI=95%,  $\alpha=0.05$ ) (5 INNs);
- fluoroquinolones – 1.93-19.67% (CI=95%,  $\alpha=0.05$ ) (4 INNs).

The frequency of purchase of antibacterial products by groups of products is distributed as follows (Chart 1):

- penicillins – 20.56-47.64% (CI=95%,  $\alpha=0.05$ );
- macrolides – 12.96-37.84% (CI=95%,  $\alpha=0.05$ );
- cephalosporins – 6.65-28.35% (CI=95%,  $\alpha=0.05$ );
- fluoroquinolones – 2.19-20.21% (CI=95%,  $\alpha=0.05$ );
- tetracyclines – 1.31-10.91% (CI=95%,  $\alpha=0.05$ );
- preparations of other groups – 0.29-14.29% (CI=95%,  $\alpha=0.05$ ) (not more than 2-6% for each group).

From the individual INNs, the frequency of purchase is as follows (Figure 4):

- azithromycin – 11.88-36.32% (CI=95%,  $\alpha=0.05$ );
- amoxicillin – 7.18-29.22% (CI=95%,  $\alpha=0.05$ );
- amoxicillin + clavulanic acid – 4.23-24.17% (CI=95%,  $\alpha=0.05$ );
- ceftriaxone – 0.18-14.58% (CI=95%,  $\alpha=0.05$ );
- ciprofloxacin – 1.35-10.75% (CI=95%,  $\alpha=0.05$ );
- other drugs – not more than 1.6-9.6% (CI=95%,  $\alpha=0.05$ ) for each individual products.

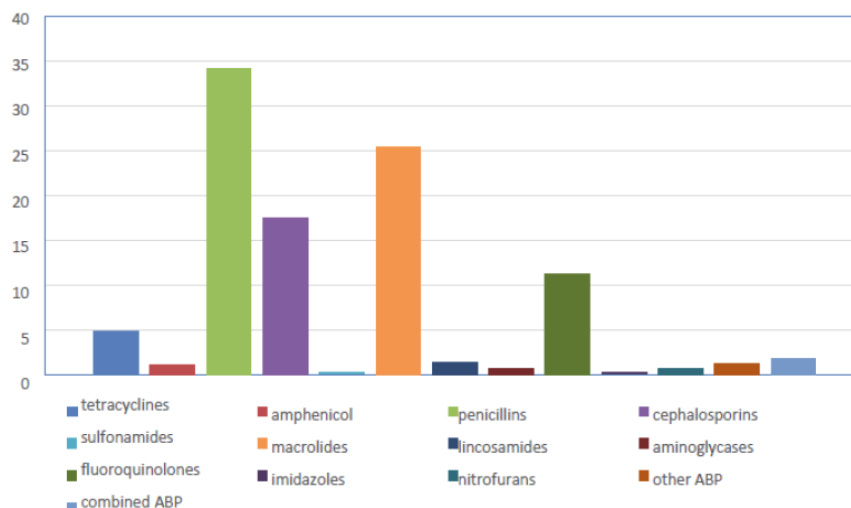
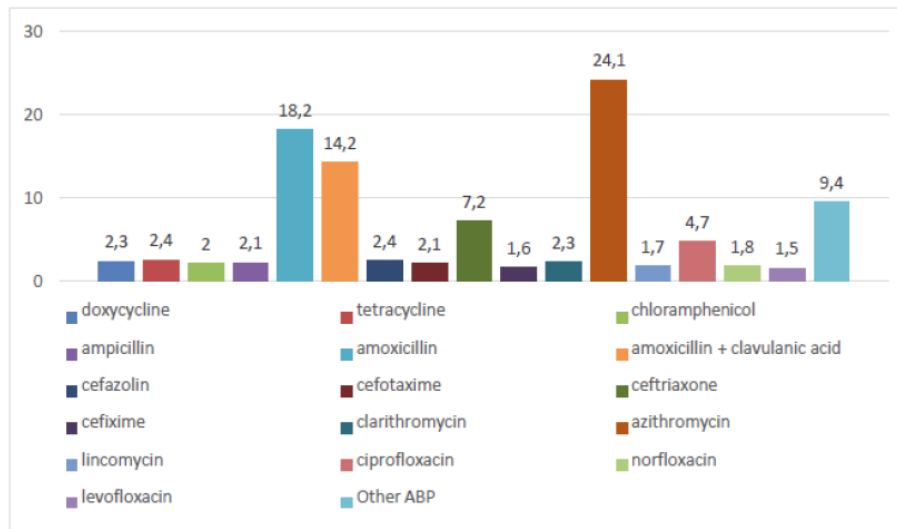


Figure 3: Frequency of purchase of antibacterial products by groups of drugs.



**Figure 4:** Frequency of purchase of certain items of antibacterials, %.

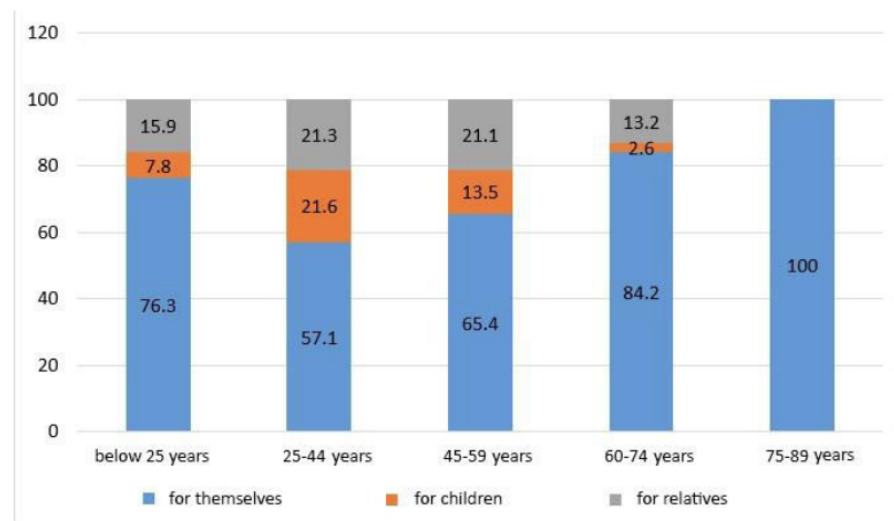
51.16-78.44% (CI=95%,  $\alpha=0.05$ ) of the respondents purchased antibiotics for own use, 6.95-28.85% (CI=95%,  $\alpha=0.05$ ) respondents bought for children, and 6.49-28.11% (CI=95%,  $\alpha=0.05$ ) for other relatives.

The frequency of purchasing antibacterial drugs for own use in relation to the age of respondents (Figure 5):

- below 25 years – 64.15 -88.45% (CI=95%,  $\alpha=0.05$ );
- 25-44 years – 42.96-71.24% (CI=95%,  $\alpha=0.05$ );
- 45-59 years –51.81-78.99% (CI=95%,  $\alpha=0.05$ );
- 60-74 years – 73.78-94.62% (CI=95%,  $\alpha=0.05$ );
- 75-89 years – 100-100% (CI=95%,  $\alpha=0.05$ ).

Antibiotics were most frequently purchased for children by respondents of 25-44 years old (9.84-33.36% (CI=95%,  $\alpha=0.05$ )). The frequency of purchase of antibacterial drugs for themselves depends on the level of education: respondents with secondary education – 74.42-94.98% (CI=95%,  $\alpha=0.05$ ); respondents with higher education – 60.78-86.02% (CI=95%,  $\alpha=0.05$ ); with secondary special education – 50.18-77.62% (CI=95%,  $\alpha=0.05$ ). It was also noted that married respondents purchased drugs for children and relatives more often 21.56-48.84% (CI=95%,  $\alpha=0.05$ ).

More than half of the study participants buy antibacterial drugs prescribed by the doctor – 44.53-72.67% (CI=95%,  $\alpha=0.05$ ). 8.73-31.67% (CI=95%,  $\alpha=0.05$ ) of the respondents decide to purchase antibiotics independently based on personal



**Figure 5:** Purpose of purchase of antibacterials depending on age, %.

experience of drug administration, and 2.52-20.88% (CI=95%,  $\alpha=0.05$ ) – on the advice of relatives and friends. 1.12-17.88% (CI=95%,  $\alpha=0.05$ ) purchase drugs based on the recommendation of pharmaceutical professionals. Own experience of the drug administration is paramount when choosing between 12.05-36.55% (CI=95%,  $\alpha=0.05$ ) of women and 2.78-21.42% (CI=95%,  $\alpha=0.05$ ) men.

An important influence on the decision-making process on the purchase of medicines is influenced by the one for whom the antibiotic is intended. By doctor's prescription: for children, antibacterial drugs are purchased in 62.4-87.2% (CI=95%,  $\alpha=0.05$ ) of cases; for themselves – 37.63-66.17% (CI=95%,  $\alpha=0.05$ ); for relatives – 44.74-72.86% (CI=95%,  $\alpha=0.05$ ).

Consumers choose their own drugs for themselves in 9.68-33.12% (CI=95%,  $\alpha=0.05$ ), for children in 2.06-19.94% (CI=95%,  $\alpha=0.05$ ), and for other relatives in 4.3-24.3% (CI=95%,  $\alpha=0.05$ ) of cases. Purchase of ABDs was associated with respiratory diseases: upper respiratory tract infections (tonsillitis, sinusitis, laryngitis, sinusitis, tonsillitis, pharyngitis, tracheitis, and "runny nose", "sore throat", "flu", "ARD", "ARVI", "cold") in 36.72-65.28% (CI=95%,  $\alpha=0.05$ ) cases, lower respiratory tract infections (bronchitis, pneumonia, "cough") in 24.13-51.87% (CI=95%,  $\alpha=0.05$ ) cases, urinary tract infections (urethritis, cystitis, pyelonephritis) in 1.43-18.57% (CI=95%,  $\alpha=0.05$ ) cases and gastrointestinal tract diseases (gastritis, gastric ulcer and duodenal ulcer, "diarrhoea") in 1.87-7.87% (CI=95%,  $\alpha=0.05$ ) cases.

## DISCUSSION

According to the study results, it was revealed that physicians most often prescribe broad-spectrum antibiotics – up to 82.68-99.12% (CI=95%,  $\alpha=0.05$ ). In many cases presented, the use of antibiotics may be unjustified, since the causative agents of these diseases may not be bacterial microorganisms only. 86.01-100% (CI=95%,  $\alpha=0.05$ ) of the interviewed respondents know how to take the antibacterial drugs purchased, whereas 0.14-15.46% (CI=95%,  $\alpha=0.05$ ) participants have no idea about the mode of administration of the drug chosen and refer to PILs or friends or relatives' advice. Taking into account the fact that the treatment regimen of various diseases may differ significantly depending on the causative agent of infection, its localisation and severity, it should be noted that the participation of doctors of different

medical profiles in the choice of the drug and the decision on its mode of administration is mandatory.

It is also worth noting that more than 26.01-53.99% (CI=95%,  $\alpha=0.05$ ) of survey participants do not have an idea of adverse effects of antibacterial drugs, while some respondents pointed out allergic reactions, headaches, impaired normal microflora, dyspeptic disorders, which are adverse effects of almost all antibiotics. Specific adverse effects, such as renal dysfunction, urine staining, tooth staining, blood formation disorders, heart rhythm disturbances, photosensitivity were indicated in single cases.

In most cases, the frequency of the purchase of antibiotics by respondents is once in 1-2 years – 31.18-59.62% (CI=95%,  $\alpha=0.05$ ). 19.39-46.21% (CI=95%,  $\alpha=0.05$ ) of the respondents buy antibacterial agents less than once in 1-2 years, whereas 10-33.6% (CI=95%,  $\alpha=0.05$ ) of the study participants purchase drugs of this group several times a year. It is reliably known that the purchase of ABDs by women occurs more frequently.

Regarding the frequency of purchasing antibacterial drugs, there is no single trend in the behaviour of people of different ages and levels of education. However, it can be noted that people younger than 25 and older than 75 years old purchase antibiotics more often than other age groups. Study participants with higher and secondary education buy antibiotics less often than other groups of respondents.

The study revealed that unmarried people are less likely to purchase various groups of ABDs. 48.56-76.24% (CI=95%,  $\alpha=0.05$ ) of respondents report the presence of ABDs in home first-aid kits. The most commonly mentioned drug groups are: penicillin's 6.42-27.98% (CI=95%,  $\alpha=0.05$ ); macrolides 2.32-20.48% (CI=95%,  $\alpha=0.05$ ); amphenicols 0.49-13.69% (CI=95%,  $\alpha=0.05$ ); tetracycline's 1.72-8.92% (CI=95%,  $\alpha=0.05$ ).

At the same time, about 4.58-24.82% (CI=95%,  $\alpha=0.05$ ) of respondents indicate that they do not purchase antibacterial drugs without a doctor's prescription. The remaining 75.18-95.42% (CI=95%,  $\alpha=0.05$ ) of respondents purchasing non-prescription antibiotics are distributed as follows: "always" – 0.24-14.44% (CI=95%,  $\alpha=0.05$ ); "often" – 5.6-26.6% (CI=95%,  $\alpha=0.05$ ); "sometimes" – 23.02-50.58% (CI=95%,  $\alpha=0.05$ ); "rare" – 12.88-37.72% (CI=95%,  $\alpha=0.05$ ). There were no differences in the respondents' behaviour, depending on the gender of the level of



education and marital status. It was also determined that patients aged from 45 to 59 years are the most rational and serious in purchasing antibacterial drugs.

When purchasing ABDs without a doctor's prescription, 17.61-43.99% (CI=95%,  $\alpha=0.05$ ), respondents rely on the recommendations of a pharmaceutical professionals, 5.9-27.1% (CI=95%,  $\alpha=0.05$ ) participants were guided by the advice of relatives or friends, and 33.14-61.66% (CI=95%,  $\alpha=0.05$ ) of consumers use personal experience with antibiotics. In addition, 1.56-9.76% (CI=95%,  $\alpha=0.05$ ) of the respondents reported that they use all sources of information mentioned to make a decision, and some people also rely on drug reviews on the Internet (1.91-4.31% (CI=95%,  $\alpha=0.05$ )). Based on consumer responses, the frequency of prescriptions for ABDs is as follows: always prescribe – 15.43-41.17% (CI=95%,  $\alpha=0.05$ ) of cases; never prescribe – 26.38-54.42% (CI=95%,  $\alpha=0.05$ ); does not always prescribe – 18.05-44.55% (CI=95%,  $\alpha=0.05$ ).

It is also worth noting that only 6.05-27.35% (CI=95%,  $\alpha=0.05$ ) pharmaceutical professionals always require prescriptions from consumers, 16.56-42.64% (CI=95%,  $\alpha=0.05$ ) of the respondents require a prescription in some cases, and in 39.46-67.94% (CI=95%,  $\alpha=0.05$ ) they never require it. This is undoubtedly a violation of the current rules for selling prescription drugs and the norms of ethics and deontology. At the same time, there was no difference in the attitude of a pharmaceutical professional to visitors of pharmacies of different genders. However, there is a significant correlation with the age of consumers: the proportion of people who always require a prescription is increased with the age of the respondent. The proportion of persons below 25 years of age is 2.92-21.68% (CI=95%,  $\alpha=0.05$ ), and the proportion of the elderly of 60-74 years of age is 14.15-39.45% (CI=95%,  $\alpha=0.05$ ). 50.07-77.53% (CI=95%,  $\alpha=0.05$ ) of the respondents state that they seek the advice of a pharmaceutical professional, even if they purchase the medicine prescribed by a doctor, and 3.67-23.13% (CI=95%,  $\alpha=0.05$ ) indicate that they always consulted pharmaceutical professionals when purchasing ABDs. At the same time, only 22.47-49.93% (CI=95%,  $\alpha=0.05$ ) of the respondents did not consider the consultation of a pharmaceutical professional as necessary if the drug was medically prescribed.

The reason for seeking advice in 30.11-58.49% (CI=95%,  $\alpha=0.05$ ) of the total number of respondents

are additional questions arising from the purchase of the drug. Pharmaceutical professionals are asked for help when they do not receive clear information about the drug: 7.48-29.72% (CI=95%,  $\alpha=0.05$ ) of the respondents, and 3.46-22.74% (CI=95%,  $\alpha=0.05$ ) when they do not receive the full amount of information from the doctor. In some cases, respondents say that they consult in pharmacies about new unknown drugs in 1.68-3.08% (CI=95%,  $\alpha=0.05$ ) and, if necessary, choose the analogue prescribed by the doctor in 1.51-2.51% (CI=95%,  $\alpha=0.05$ ). Respondents with different levels of education also have significant differences in the frequency of seeking advice from pharmaceutical professionals.

According to the survey, 91.6-100% (CI=95%,  $\alpha=0.05$ ) of the respondents become familiarised with PILs for ABDs, and 59.52-85.08% (CI=95%,  $\alpha=0.05$ ) of the respondents always do it. In this respect, women are more attentive, indicating that they always read PILs in 63.1-87.7% (CI=95%,  $\alpha=0.05$ ) of cases before use, while men do it only in 44.63-72.7% (CI=95%,  $\alpha=0.05$ ). The proportion of those who always read PILs is 51.05-78.35% (CI=95%,  $\alpha=0.05$ ) among those who rarely purchase antibacterial drugs, 61.82-86.78% (CI=95%,  $\alpha=0.05$ ) in those who buy antibiotics once in 1-2 years, and 64.39-88.61% (CI=95%,  $\alpha=0.05$ ) in the case of more frequent purchases. Respondents who never purchase antibiotics without prescription read PILs less frequent than those groups of respondents who purchase them without a doctor's prescription with varying frequency. This fact suggests that the frequency of reading PILs for antibacterial drugs is related to the frequency of purchasing ABDs without a doctor's prescription.

The attention paid by respondents to different paragraphs of PILs for ABDs is different. The sections of PIL are distributed by frequency of reading PIL as follows:

- dosage, method of administration and duration of treatment 66.64-90.16% (CI=95%,  $\alpha=0.05$ );
- indications for use – 69.18-91.82% (CI=95%,  $\alpha=0.05$ );
- contraindications – 57.92-83.88% (CI=95%,  $\alpha=0.05$ );
- undesirable effects – 31.08-59.52% (CI=95%,  $\alpha=0.05$ );
- composition – 16.39-42.41% (CI=95%,  $\alpha=0.05$ );
- warning and precautions – 14.83-40.37% (CI=95%,  $\alpha=0.05$ );

- interaction with other drugs and (or) food – 13.64-38.76% (CI=95%,  $\alpha=0.05$ );
- storage – 12.05-36.55% (CI=95%,  $\alpha=0.05$ );
- overdose symptoms and treatment – 6.57-28.23% (CI=95%,  $\alpha=0.05$ );
- use of the drug during pregnancy, breastfeeding, paediatric use, adults with chronic diseases – 5.02-25.58% (CI=95%,  $\alpha=0.05$ );
- manufacturer – 0.53-16.47% (CI=95%,  $\alpha=0.05$ ).

## CONCLUSIONS

The results of the study obtained during data processing indicate a low level of consumer knowledge of antibacterial drugs. It is also important that more of the consumers who purchased ABDs on the basis of independent choice or relatives' advice, bought out-of-date drugs which were potentially more toxic (chloramphenicol, tetracycline, co-trimoxazole, etc.).

Despite the fact that more than half of the study participants have antibiotics in their home medicine cabinet, no sufficient attention is paid to such characteristics of the drugs as side effects, precautions for use and storage conditions, which indicates a low level of security during the use of ABDs in outpatient clinics. It should be noted that patients over 60 use self-medication with ABDs most often.

Previous experience of drug administration as the reason for choosing an antibiotic takes the third place after doctor's prescription and the price of the drug, which indicates a low level of knowledge of the population regarding infectious diseases. The situation described shows insufficient compliance with job descriptions and incomplete observance of the obligations regarding the prescription and dispensing of prescription drugs by doctors and pharmacists. Based on the results of the study, it can be concluded that it is necessary to increase the reasonable use of antibacterial drugs through the improvements in professional knowledge of the pharmacists and doctors of the prescription and distribution of antibacterial drugs.

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