

### Research Article

## The Antibiotic Knowledge, Attitudes, and Behaviors of Patients Purchasing Antibiotics without Prescription: Results of National Survey

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*Background.* The inappropriate and overuse of antimicrobials is a problem worldwide. To target future interventions, a thorough understanding of current behavior reasons is needed. The aim of the study was to explore antibiotic knowledge, attitudes, and behaviors among patients residing in Russia. *Methods.* In total, 149 semistructured interviews were carried out with respondents using antibiotics without prescriptions. Interviews were used to assess participants' practices to treat symptoms of a confirmed/ suspected infectious disease and their behaviors, knowledge, and attitudes toward the use of antimicrobials. A directed content analysis was applied. *Results.* Despite regulation, inappropriate use of antibiotics is a common practice. Knowledge on the mechanism of action and indications for the use of antibiotics was generally low. However, self-diagnosis, self-treatment with antimicrobials, and attempts to purchase antibiotics in pharmacies with no prescription were quite common. Family members and friends were involved in decisions about treatment strategy. Time spent for the doctor's visit, fear to be exposed to additional infections in outpatient clinics/hospitals, previous experience with antimicrobial self-treatment, and "loyal" policy of selling antibiotics influenced the respondents' decisions of not going to the doctor. COVID-19 made an impact on antimicrobial self-treatment: there was a substantial complexity in contacting a medical healthcare provider. Most of the respondents did not pay much attention or even noticed informational materials on the proper use of antibiotics. *Conclusion.* Self-treatment with antibiotics in Russia exists. Conducted information campaigns were not effective enough as the low level of knowledge about antimicrobials and antimicrobial resistance was revealed by the present study.

#### 1. Background

Antimicrobial resistance (AMR) is a global problem leading to an increase in morbidity and mortality, as well as significant economic impact [1–3]. AMR threatens the effective antibiotic (AB) treatment of an ever-increasing range of bacterial infections. As the current widespread of AMR undermines the achievements of modern medicine [4], the number of governments around the world devoting time and resources is progressively growing. Russia, along with Brazil, India, China, and South Africa, accounted for 76% of the overall increase in global AB consumption [5], belonging to the group of countries with moderate consumption of AB in general [6]. According to the latest data, in Russia, the percentage of patients who selfmedicate with antibiotics is estimated to be about 28.5% in 2022 [7]. In contrast, European countries like Sweden (2%) and Slovakia (3%) have the lowest rates of self-medication with antibiotics [8].

Many factors may contribute to inappropriate AB use, such as prescribing habits, availability of ABs, and the demand for ABs. Over-the-counter (OTC) dispensing of AB and self-medication is common in Russian society [7]. The situation has probably even worsened during the COVID-19 pandemic due to an increase of irrational AB prescribing [9, 10]. The legislation of the Russian Federation clearly defines the rules requiring a prescription when purchasing systemic AB; however, in many regions, these conditions are not met. This leads to an incorrect and harmful attitude toward AB use by health care professionals, pharmacists, and also the population [5, 7, 11, 12].

A significant increase in the prevalence of multiresistant bacterial pathogens has been observed among both inpatients and outpatients in Russia [13]. In order to combat this, the national strategy to prevent the spread of AMR was approved by the Russian government in 2017 and 2020, respectively. A number of national guidelines targeting appropriate AB use are available nowadays, and some interventions aimed at reducing AMR in Russia have demonstrated a beneficial effect on the practice of AB use. However, more initiatives are needed [14].

In order to reduce the inappropriate use of AB and to prevent the rapid increase of AMR rates, a clear understanding of the patients' motivation to use ABs is needed, with an emphasis on their knowledge, attitudes, and behaviors regarding AB use and AMR.

#### 2. Materials and Methods

The study investigated practices, knowledge, and attitudes toward the use of ABs to treat symptoms of a confirmed or suspected infectious disease by carrying out structured interviews. The interviews were conducted among residents of eight federal districts (FDs) of the Russian Federation: Central, North-Western, Southern, Volga, Ural, Siberian, Far-Eastern, and North Caucasian FDs. Each FD was represented by two cities, with the exception of Central and North-Western, where Moscow and Saint Petersburg were analyzed separately. The interviewees were both city residents and residents of rural areas located near the city. Interviewing was chosen as an appropriate method to study practices, knowledge, and attitudes related to the use of AB, as this method was shown to reveal important details of the specific situations when AB was prescribed, purchased, and taken [15]. Structured interviews were conducted separately for respondents who directly consulted a doctor and, as a result, received a prescription for AB and respondents who bought AB at a pharmacy without a prescription.

2.1. Training of Research Teams. Several online Zoom training seminars were organized in December 2021–January 2022 in order to prepare 21 interviewers from 18 participating cities to conduct a semistructured interview. Led by three researchers from an established Social Pharmacy research group of the University of Copenhagen, these seminars covered the main aspects of qualitative research methodology, introduction to qualitative research, and practical sessions. The researchers had substantial experience with conducting semistructured interviews, so they had been teaching on how to conduct an appropriate interview.

2.2. Study Population and Inclusion Criteria. Adult residents (18–74 years) who had used systemic AB of any group for the treatment of symptoms of a confirmed/suspected infectious

disease within 3 months prior to the interview took part in the study. Individuals aged 75 and older were excluded from the study due to certain age-related features: these patients rarely make their own decisions regarding the start of AB and the choice of specific drugs. Also, due to the mental characteristics of this age group patients, it may be difficult to conduct a semistructured interview and to get a detailed reliable description of the specific case of using AB. An informed consent was obtained from every interviewee. The main criteria for selecting respondents were gender, age, education, and place of residence (urban/rural). The distribution of respondents for each criterion was based on the data of the Federal State Statistics Service [16] available at the time of the study (Table 1).

The sample size for the study was 300 respondents (in this paper, results of the 149 interviews with respondents who had no AB prescription are reported). As of January 01, 2021, the population of the Russian Federation aged 18–74 was 107,329,853 people. Thus, with a sample size of 300 people, the width of the 95% confidence interval margin of error was no more than  $\pm 5.7\%$ . The overall age interval was further divided into three age subgroups according to the classification of the World Health Organization (WHO): 18–44 years (young age), 45–59 years (middle age), and 60–74 years (old age).

According to the level of education, the respondents were divided into the following three categories:

- (1) Higher education (HE): professional higher, professional postgraduate;
- Secondary education (SE): vocational primary, vocational secondary, incomplete HE;
- (3) General education (GE): general secondary (complete).

The share of the population with included types of education is 80%-85% out of the total population of the Russian Federation, which can be considered comparable to the share of the population aged 18-74 (73%). At the same time, the proportion of respondents without primary GE is about 1%, and only in certain regions of the North Caucasian FD reaches 3%-4%, and therefore it can be neglected. Thus, during the study, it was assumed that all respondents previously received a general primary and general basic education.

The division of respondents into urban and rural residents is due to significant differences in the level of access to medical care and drugs, as well as a possible difference in the well-being of the population, which affects the principles underlying the choice of therapy.

The number of respondents in each FD was determined in proportion to its share in the total population of the Russian Federation (Table 1). The distribution of the number of respondents between the cities among one FD was carried out evenly.

2.3. Recruitment of Respondents. The call for respondents who met the inclusion criteria was carried out in social networks, pharmacies, polyclinics, and hospitals, with the help of professional patients' societies, personal contacts, etc. The

Federal district	City	Population size ( <i>n</i> )	Total number of respondents
Moscow		12,655,050	14
Saint Petersburg		5,384,342	6
Central	Smolensk Yaroslavl	26,595,950*	27
North-Western	Arkhangelsk Kaliningrad	8,557,658**	9
Southern	Volgograd Krasnodar	16,482,500	17
Volga	Saransk Kazan	29,070,800	29
Ural	Tyumen Chelyabinsk	12,329,500	10
Siberian	Novokuznetsk Krasnoyarsk	17,003,900	18
Far-Eastern	Yakutsk Vladivostok	8,124,000	9
North Caucasian	Grozny Stavropol	9,967,300	10

TABLE 1: Cities participated in the study.

\*Excluding population of Moscow; \*\*Excluding population of Saint Petersburg.

method of searching for respondents was not regulated and was indicated in each interview.

2.4. Data Collection Methods. The interviewers used two different validated versions of the interview guide: for a patient taking antibiotics with a prescription and for a patient taking antibiotics without a prescription.

The overall purpose of each interview was to obtain information regarding knowledge, attitude, and practice of using AB by the population, such as follows:

- (1) General process of making a diagnosis;
- (2) Overview of making a decision on prescribing an antibiotic;
- (3) Reasons for choosing a particular antimicrobial;
- (4) Details (where and how) of an antibiotic purchase;
- (5) Rate of satisfaction with the process of purchasing an antibiotic;
- (6) General knowledge about antimicrobials;
- (7) Attitude toward antibiotics.

The interview-guides comprised of the following two parts:

- A detailed description of the last time the respondent received an AB prescription or the last time the respondent bought an AB;
- (2) Description/reflection on the participants' reminiscence of the most recent AB purchase (if it actually corresponds with the general process of an antibiotic prescription/purchase).

This subdivision was due to the principle that reliable results can be obtained only on the basis of a detailed story and reactions of respondents to any specific situation regarding AB. In order to make sure this case is typical, information was also collected about other similar cases.

Interviews were conducted by 21 researchers in Moscow, Saint Petersburg, and Arkhangelsk; interviews were conducted by two independent persons; in all the remaining cities that participated in the study, only one interviewer supervised one city. The interviews were taken in a quiet environment or at the interviewer's workplace, according to the preferences of the respondent. The interviewers did not have a personal relationship with any of the respondents. All interviews were audio recorded and then transcribed by the interviewers independently (Table 2). Names and any description that could identify a particular person were removed during the transcription process to provide anonymity. Each transcript contained the general profile of the interviewee to demonstrate the diversity of the surveyed population.

2.5. Data Analysis. The relevant answers from each transcript were deductively identified and extracted. Then, one participant's answers were compared with the answers of other participants within the same group. This was done to get a general pattern of that group's behavior, attitude, and knowledge toward the use of ABs. In the third step, to obtain a complete picture of typical AB behavior, attitudes, and knowledge, the pattern of each group of interviewees was compared with the other groups. Researchers carried out the first step separately, then their results were compared in a consensus meeting, and afterward, the final analysis was done jointly. This approach was considered to be optimal to ensure the maximum strength of the received data.

2.6. Ethical Consideration. The study was approved by the Independent Ethics Committee at the Federal State

			TABLE 2: Meth	nodological inform	mation about th	e conducted inter	views.			
			Central	North-Western	Southern	Volga	Ural	Siberian	Far-eastern	North Caucasian
Location of interviews	Moscow	Saint Petersburg	Smolensk Yaroslavl	Arkhangelsk Kaliningrad	Volgograd Krasnodar	Saransk Kazan	Tyumen Chelyabinsk	Novokuznetsk Krasnoyarsk	Yakutsk Vladivostok	Grozny Stavropol
Number of interviewers	2	2	2	ę	2	2	5	5	2	2
Interviewer(s) profession	Doctor	Doctor	Sociologist pharmacist	Doctor	Doctor	Doctor	Resident doctor	Psychologist pharmacist	Doctor resident	Doctor resident
Work place of interviewer(s)	Clinical hospital Medical university	Medical university City polyclinic	State University Private medical organization	Medical university City hospital	Medical university	State university, faculty of medicine City polyclinic	Medical university	Secondary school Medical university	Federal university, faculty of medicine Medical university	State university, faculty of medicine Regional clinical hospital
Preferential recruitment method	Selection by posting information on social networks and professional network	Selection by posting information on social networks	Random selection among pharmacy customers	Random selection among polyclinic patients	Selection by posting information on social networks	Random selection among pharmacy customers	Selection by posting information on social networks	Random selection among pharmacy customers and professional network	Selection by posting information on social networks and professional network	Use of professional network to recruit
No. of interviews	14	9	27	6	17	29	10	18	6	10

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Budgetary Institution of Higher Education "Smolensk State Medical University" of the Ministry of Health of the Russian Federation, Protocol No. 239 (February 17, 2022).

Each interview was conducted only after obtaining the informed consent (orally or in written form). The inclusion of respondents and the interviewing process itself were conducted in accordance with the Declaration of Helsinki in order to respect human rights, maintain anonymity, and obtain the informed consent of the participants.

#### 3. Results

One hundred forty-nine interviews surveyed in February– June 2022 were conducted with respondents who had no AB prescription. The overall demographics of the participants without a prescription are shown in Supplementary 1. The respondents' ages ranged from 19 to 71 years. The mean age for surveyed females was  $46.4 \pm 15.4$  years (49% of respondents) and  $39.6 \pm 14.7$  years—for males included in the study. Respondents with HE, SE, and GE included in the survey comprised 50.3%, 26.2%, and 23.5%, respectively. The major part of the interviewees were urban dwellers (71.8%).

3.1. Commonly Described Symptoms. The vast majority of respondents encountered similar manifestations of predominantly respiratory infection and described such symptoms as cough, nasal congestion, sore throat, fever, shortness of breath, weakness, and headache. In most cases, the duration of the symptoms ranged from 1 to 14 days. In general, the interviewees assumed they had an acute respiratory viral infection, tonsillitis, COVID-19, bronchitis, sinusitis, or influenza. Only a small percentage of respondents in all FDs had no idea on the exact cause of the experienced symptoms.

*3.2. Reasons to Avoid Going to the Doctor.* The main motivations why the interviewees preferred not to see a doctor were as follows:

- (1) Lack of time (long waiting time for a doctor's visit at home or queues at the doctor's office);
- (2) Fear of making contact with other contagious patients with infections in healthcare facilities;
- (3) Positive experience with the self-use of a particular AB to treat similar symptoms.

Less often, respondents avoided going to the doctor because they did not want to take a sick leave, as it is economically unprofitable (Central, Siberian, Far-Eastern, Volga, and North-Western FDs). Other reasons included doubts about the competence of the doctors (Southern and Ural FDs), difficulties in making a house call (North Caucasian FD), or contacting a doctor when not attached to a specific medical facility (Saint Petersburg).

The 22 interviewees (14.8%) from Moscow, Southern, Siberian, North-Western, Far-Eastern, and Ural FDs consulted a doctor, but the initiative to use ABs came from the respondent. The reasons for that were that AB was not prescribed during the consultation; however, the respondent considered the prescriptions they were given being insufficient or independently decided to take ABs before the visit to the doctor (self-treatment). And this was primarily due to the long waiting time for a doctor's visit and queues at the doctor's office.

3.3. Influence of the Internet and Public Environment. The majority of respondents did not use the Internet to search for the information about symptoms of the disease due to the fear to get unreliable information on possible diagnoses or previous experience of self-treatment with AB when having similar complaints. The opposite trend was found in the North-Western, Volga FDs, and Saint Petersburg, where respondents web-searched for the information about symptoms more often. The main goal of the Internet search was to self-make a diagnosis by typing the symptoms in the search line or to find out information regarding AB therapy to initiate the self-treatment. The major part of interviewees discussed their symptoms with family and friends. As a result, they received a recommendation to consult a healthcare provider and not to self-medicate. However, a few had a recommendation from people with no medical education to start antimicrobial treatment and, what is more, which specific AB to take.

3.4. ABs in Home First-Aid Kits. There were three main scenarios for the behavior of the respondents. The majority checked their home first-aid kit, but AB was not available there. In equal proportion, interviewees kept AB in their home first-aid kit or did not check their first-aid kit at home, because they knew there was no AB in it. Three respondents out of nine from the Far-Eastern FD stated they always have an AB in stock at home. Eight interviewees (Ural, North Caucasian, and Volga FDs) used AB from their home first-aid kit. However, they were forced to go to the pharmacy because the AB from the first-aid kit was not enough for the course of treatment. One respondent from North-Western FD used AB from a friend's first-aid kit (Table 3).

3.5. The Process of Obtaining AB. The respondents based their choice of pharmacy on the location: the closest and/or located along the way. As a rule, the interviewees were not familiar with the pharmacist. The vast majority of respondents went to the pharmacy with a specific purposeto buy an AB with no doubt they would be able to purchase it without a prescription. Twenty-eight out of 149 respondents (Volga, Southern, Central, Far-Eastern, Ural, Siberian, North Caucasian FDs, and Moscow) turned to a pharmacy in order to receive advice on treatment and were waiting for the pharmacist's recommendations in choosing an AB. The visit to the pharmacy was carried out according to the scheme "request for an AB—its sale," pharmacists did not ask about the availability of a prescription at all, or the respondent's oral assurance of a medical prescription was sufficient. The majority of interviewees in the Southern, Central, Siberian, Far-Eastern, and Volga FDs reported their symptoms to the pharmacist in order to describe the severity of the condition and, probably, in this way, tried to promote the OTC sale of

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Federal district/center	Total number of respondents	Availability of AB in first-aid kit, $\%$ ( <i>n</i> )				Used AB from first-aid kit, % ( <i>n</i> )	
		Yes	No	Did not check	Question was not asked	Yes	No
Moscow	14	35.7 (5)	14.3 (2)	42.9 (6)	7.1 (1)	0 (0)	100 (14)
Saint Petersburg	6	16.7 (1)	33.3 (2)	33.3 (2)	16.7 (1)	0 (0)	100 (6)
Central	27	3.7 (1)	59.3 (16)	29.6 (8)	7.4 (2)	0 (0)	100 (27)
North-Western	9	22.2 (2)	22.2 (2)	44.4 (4)	11.1 (1)	11.1* (1)	88.9 (8)
Southern	17	11.8 (2)	70.6 (12)	11.8 (2)	5.9 (1)	0 (0)	100 (17)
Volga	29	11.1 (3)	66.7 (18)	29.6 (8)	0 (0)	3.7 (1)	96.3 (28)
Ural	10	30 (3)	50 (5)	10 (1)	10 (1)	10(1)	90 (9)
Siberian	18	44.4 (8)	55.6 (10)	0 (0)	0 (0)	27.8 (5)	72.2 (13)
Far-Eastern	9	33.3 (3)	66.7 (6)	0 (0)	0 (0)	0 (0)	100 (9)
North Caucasian	10	50 (5)	30 (3)	20 (2)	0 (0)	20 (2)	80 (8)
Total	149	22.1 (33)	51 (76)	22.1 (33)	4.7 (7)	6.7 (10)	93.3 (139)

TABLE 3: Availability and use of AB from a home first-aid kit.

\*Used AB from a friend's first-aid kit.

AB, or in hope to get a pharmacist's advice. Four respondents from the Central, Volga, and Ural FDs admit they used an invalid prescription to facilitate the purchase process or deceived (Ural, Volga, Central FDs, and Moscow) about the existence of a prescription when they were faced with a pharmacist's reluctance to sell AB. In Moscow and Siberian FD, a pharmacist asked to hide the fact of the OTC sale of AB. Apart from that, a pharmacist from the Central FD told the respondent he was ready to sell AB without a prescription himself since it would have totally no negative consequences for him. Nine respondents from the Siberian, Central, North-Western FDs, Saint Petersburg, and Moscow were denied the sale of AB without a prescription; however, it is worth mentioning all interviewees (except one from the North-Western FD) eventually managed to purchase AB without a prescription at another pharmacy. Several patients described how they had to cheat, for example, by deceiving they had forgotten the prescription at home or being extremely persuasive. The only North-Western FD respondent failed to change the pharmacist's decision and purchase an AB; he was forced to use an AB offered by a friend from her home first-aid kit (Table 4). The majority of interviewees reported it has become more difficult to obtain AB without a prescription. Most of the respondents in the North Caucasian, Far-Eastern, and Southern FDs reported they did not feel any changes when buying AB without a prescription and did not experience any difficulties with this process at all.

3.6. Choice of ABs. In the vast majority of centers, the respondents made the decision to use a particular AB on their own or using the recommendation of friends. The exception was the Far-Eastern FD, where, more often, respondents purchased ABs recommended by a pharmacist. In other FDs, such interviewees were a minority. When choosing an AB, the respondents relied on their personal or friends' positive experiences with this particular drug. More often, respondents used AB, which was previously prescribed by a doctor in case of similar symptoms.

3.7. Knowledge and Attitude toward AB. Respondents' knowledge on the ABs' mechanism of action is vague,

fragmentary, and in most cases, is based on conjecture. More often, the respondents only briefly described the action of AB as "killing microbes" or "acting on bacteria." Often, the ideas of respondents about AB were completely wrong: "ABs kill viruses and fungi," "AB strengthen" or, conversely, "reduce immunity." Very rarely, respondents demonstrated a lack of knowledge that AMR is a problem. The main sources for obtaining knowledge about ABs were the Internet, promotional materials, TV, newspapers, a summary of product characteristics, and conversations with a doctor, pharmacist, or acquaintances. In equal proportion of respondents noted they had come across various campaigns about AB (Moscow, Siberian, North-Western, Volga, and Southern FDs) or did not see such educational materials (Saint Petersburg, Central, Ural, North Caucasian, and Far-Eastern FDs). Some respondents in all FDs reported they had seen informational materials (mainly posters and brochures disseminated in healthcare facilities or pharmacies) but were not interested in them and did not remember any information out of them.

3.8. Behavior. Respondents reported the main indications to use of AB are diseases accompanied by fever, ineffectiveness of symptomatic therapy, long-term course of the disease, and bacterial infection. According to the majority of surveyed, ABs should not be used in case of mild severity of disease, which respondents correlated with the "good general health condition," believing that "the organism itself is able to cope with the disease." In all the study centers, some interviewees reported the ineffectiveness of AB in the case of viral etiology of the disease.

3.9. The Impact of the COVID-19 Pandemic. In most FDs, the situation associated with the pandemic did not affect respondents' attitudes toward AB and behavior. Only in the Volga FD, around a half of respondents changed their attitude toward AB during the pandemic stating the use of AB in the case of a viral etiology of infection is inappropriate. Some respondents in various FDs reported that during the pandemic, they began to adhere to the sanitary and epidemiological recommendations guidelines (social distancing, the

		Consulted %	l a doctor, ( <i>n</i> )	Who influ	enced the initiation of	AB therapy, % (	<i>(u)</i>	AB purcha	se, % (n)
reaeral aistrict/center	t otal number of respondents	Yes	No	Friends or family	Personal decision	Pharmacist	Internet	In the first pharmacy	In the second or more pharmacy
Moscow	14	50 (7)	50 (7)	57.1 (8)	28.6 (4)	7.1 (1)	7.1 (1)	92.9 (13)	7.1 (1)
Saint Petersburg	6	0 (0)	100 (6)	16.7 (1)	83.3 (5)	0 (0)	0 (0)	66.7 (4)	33.3 (2)
Central	27	0 (0)	100 (27)	40.7 (11)	77.8 (10)	11.1 (3)	11.1 (3)	92.6 (25)	7.4 (2)
North-Western	6	22.2 (2)	77.8 (7)	66.7 (6)	0 (0)	0 (0)	33.3 (3)	77.8 (7)	$11.1^{*}$ (1)
Southern	17	17.6 (3)	82.3 (14)	41.2 (7)	41.2 (7)	17.6 (3)	0 (0)	100 (17)	0 (0)
Volga	29	0 (0)	100 (29)	20.7 (6)	48.3(14)	13.8(4)	17.2 (5)	100 (29)	0 (0)
Ural	10	30 (3)	70 (7)	10(1)	70 (7)	10(1)	10(1)	100 (10)	(0) (0)
Siberian	18	22.2 (4)	77.8 (14)	22.2 (4)	61.1 (11)	5.6 (1)	11.1 (2)	88.9 (16)	11.1 (2)
Far-Eastern	6	11.1(1)	88.9 (8)	0 (0)	77.8 (7)	22.2 (2)	0 (0)	100 (9)	0 (0)
North Caucasian	10	20 (2)	80 (8)	20 (2)	70 (7)	10(1)	0 (0)	100 (10)	0 (0)
Total	149	14.7 (22)	85.2 (127)	30.8(46)	48.3 (72)	10.7(16)	10.1(15)	94.6 (140)	5.4 (8)
*Due to the pharmacist's	refusal to sell AB, respondent was	forced to use	e an AB from f	riend's home first-aid	kit.				

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use of personal masks, and personal protective equipment), started to monitor their health more carefully, decided not to go to the doctor due to the fear of getting infected in healthcare facilities, as well as anxiety about their health and the course of the disease.

#### 4. Discussion

Self-medication with ABs among respondents without a prescription in all investigated regions is a complex phenomenon driven by a variety of factors. These determinants are related to the following:

- The healthcare organization level (difficulties in going to the doctor, "loyal" policy of selling AB with no prescription in a pharmacy despite the restrictive state regulations);
- (2) The patient level (common practice of self-diagnosis, low knowledge of AB);
- (3) The impact of the COVID-19 pandemic leading to the irrational use of ABs and increased risk of AMR.

Since March 2017, the rules for the sale of medicines have been tightened due to the WHO concerns for the uncontrolled use of ABs by people of all countries. This was intended to restrain the problem of worldwide AMR increase. A recent study shows that the majority of European countries developed the broad range of national laws and legal regulations to reduce non-prudent use of ABs [17]. However, motives that drive patients to self-medicate are not easy to change. Over the last decade, the relationship between healthcare professionals and patients has changed; in particular, the relationship has changed unfavorably for pharmacists as they experience more patient pressure [18-21]. A ban on the sale of AB without a prescription was one of the main interventions to address this issue. However, recent studies conducted in Russia [7, 12] have shown that the sale of AB without a prescription is still a common practice. According to the literature, pharmacists sell AB illegally OTC for the following three main reasons:

- (1) Commercial interest;
- (2) Compassion and desire to help patients;
- (3) The assumption is that it is counterproductive to resist patient demand for AB as they could easily obtain it in another pharmacy [20, 22, 23].

Pharmacists in Russia seem to be more influenced by the two latter. At least during the study, no data were obtained to suspect any special commercial interest of pharmacists during the sale of ABs. The relevant aspects of the use of AB in Russia have been identified in this study: the respondents forced the pharmacist to break the rules (interviewees described how they could cheat about the existence of a prescription or intentionally describe non-existing symptoms). It is very important to highlight these situations cannot justify such a "loyal" policy of selling AB against the regulations set by governmental authorities. Colleagues from other countries also reported results of quantitative national studies demonstrating the common practice of selling ABs without a prescription in community pharmacies [24, 25].

In general, respondents consider ABs as easy-to-get products that can be purchased at any time as self-medication and self-prescribed according to the previously experienced diagnosis and/or symptoms. A significant proportion of surveyed participants described having suffered from the same symptoms before and, therefore, thinking they knew the likely diagnosis. However, even if the respondent did not know about his symptoms himself, he was influenced by the family/friends with no medical education, believing to understand the reason of these symptoms and how they should be treated. All this led to prevalent self-treatment with ABs. Sometimes, family/friends recommended to take the specific brand of AB. In other published studies conducted in Northwest Russia and in the WHO Eastern European region [11, 12], a similar practice of self-medication was demonstrated. It is important that some circumstances forcing the interviewees to self-medicate were identified during these studies. Often, the reason for self-medicate was the inability or substantial difficulty to get to the doctor (long waiting time for a doctor's visit at home, queues at the doctor's office, contacting a doctor without being attached to a regional medical facility, lack of doctors of a certain specialization at the outpatient clinic). All these results provide rationale for the future studies to gain more insight into FD-dependent factors, which may be vital in explaining the behavior of self-medication with ABs.

Russian Federation and a large number of EU countries conduct numerous information campaigns to raise awareness among the population and to educate them on the rational use of ABs. However, it is controversial if such campaigns use the right messages and target the correct population groups. Overall, the surveyed respondents in this study did not notice these awareness campaigns at all or did not gain any information out of them. At the same time, the effect of some campaigns has been analyzed previously, showing the decrease in antibiotic use in France and Belgium [26, 27]. Probably, this was due to the poor level of knowledge about antimicrobials found in our survey. These results are in line with a recent qualitative study demonstrating that poor awareness of AMR was more often reported among participants using ABs without prescription [12]. A small number of respondents described AMR in the context of the impact on their own bodies. And very rarely interviewees demonstrated knowledge of AMR as a global problem affecting not only present but future patients. The lack of alertness of AMR certainly contributes to the uncontrolled and inappropriate use of ABs among the general population. Our results are consistent with qualitative studies in Australia [28, 29] and Germany [30].

A special impact to the rapid increase of AMR and irrational use of ABs could be explained by the recent pandemic in 2019–2022. COVID-19 significantly affected healthcare systems and antimicrobial consumption. Watson et al. [31] demonstrated the increased significance of pharmacists at local community pharmacies in maintaining the healthcare system during the COVID-19 pandemic. The population began to turn to the pharmacist more often as a doctor for advice on the treatment of symptoms of the disease [7]. Despite the fact that COVID-19 is a viral disease, according to researchers from different countries, the frequency of use of ABs in patients with SARS-CoV-2 infection has increased significantly [32–34]. Our results are consistent with the data of colleagues, although a contradiction in the answers of the interviewees was revealed. When asked directly about the impact of the COVID-19 pandemic on respondents' behavior, the majority reported they did not feel any changes. However, an analysis of the entire interview suggests the opposite conclusion. A significant part of the respondents did not go to the doctor because of fear to contact contagious patients with SARS-CoV-2 infection in healthcare facilities, could not make an appointment, or did not wait for a doctor's visit at home due to the excessive workload. Besides, some part of the respondents self-used ABs, suggesting that COVID-19 may be associated with secondary bacterial complications.

#### 5. Conclusion

Several features of patients' knowledge, behavior and regarding AB were identified: lack of a doctor's consultation before starting AB therapy, lack of time (long wait for a doctor's visit at home, queues at the doctor's office), fear of contact with additional infections in health facilities, easy access to AB from the home first-aid kits, positive experience with an AB use, confidence in the free purchase of AB in a pharmacy without a prescription. Family members and friends, who usually do not have a medical education, have a great influence on the decision to initiate antibacterial therapy. A large role in the spread of AMR is due to the noncompliance of pharmacy workers with the requirements for the prescription sale of AB: respondents had no difficulty in purchasing AB without a doctor's prescription. Moreover, in some regions, the pharmacist is considered by interviewees as a doctor competent in choosing a specific AB. During the period of pandemic, there was an increased difficulty in contacting a healthcare provider due to a shortage of medical personnel. The population has become much more tended to mistakenly use ABs for prophylactic purposes or for treatment of the COVID-19. In particular, this is due to an insufficient level of knowledge on the mechanism of action and indications for the proper use of ABs. Despite ongoing efforts to raise public awareness, the interviewees did not encounter information campaigns or materials about AB or did not remember any of the information received. These findings can provide the basis for constructing future initiatives to ensure the rational use of ABs in order to prevent the rapid AMR increase.

#### **Data Availability**

Data are available upon request (E-mail: Polina.antoschkina@yandex.ru). Given the need to maintain the anonymity of study participants, the study materials were not made publicly available.

#### **Additional Points**

Strengths and Limitations of the Study. We recognize our study has some limitations. In terms of sampling of respondents, the participants were recruited through snowballing sampling; some participants were remotely acquainted with the interviewers; therefore, they could intentionally describe a more competent attitude toward AB or have higher knowledge about ABs than the general population. Some of the limitations relate directly to the research method-a semistructured interview. Sometimes, limited probing questions were asked (interviewers received short answers to questions and did not follow up on details to benefit for the deeper investigation). We were unable to assess the impact of some factors, such as cultural background and socioeconomic status, on respondents' knowledge, attitudes toward antibiotics, and behaviors. As to the strengths of the study, as far as we know, this is the first study with a relatively large number of people interviewed in different FDs of the Russian Federation, enabling to compare the variability of AB use attitude and behavior. The calculated sample with distribution by gender, age, level of education, and place of residence was based on the data of the Federal State Statistics Service available at the time of the study. This allows us to consider that the results obtained can be extrapolated to the whole country.

#### **Conflicts of Interest**

The authors declare that they have no conflicts of interest.

#### **Authors' Contributions**

Conceptualization was done by S.R.; methodology was done by S.R. and P.Z.; investigation was done by S.R., P.Z., D.M., D.S.; writing original draft preparation was done by S.R., P.Z., and I.P.; writing review and editing was done by S.R. and R.K. All authors have read and agreed to the published version of the manuscript.

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#### **Supplementary Materials**

The overall demographics of the participants without a prescription. *Supplementary 1*: overview of respondents. (*Supplementary Materials*)

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