ORIGINAL ARTICLE

Problems of antimicrobial resistance in the primary health care system (results of the sociological study)

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ABSTRACT

Aim: To assess the level of awareness of primary health care physicians regarding the problem of antimicrobial resistance and identify the main obstacles to the rational use of antibiotics in practice.

Materials and Methods: A sociological survey was conducted among primary health care physicians using a specially designed questionnaire containing questions on knowledge, antibiotic prescribing practices, and ways to address the problem of antimicrobial resistance. The survey was conducted in January 2025. Descriptive and analytical statistics were used to analyze the results obtained from 221 respondents.

Results: Most respondents (about 90%) encountered cases of antimicrobial resistance in their work. The respondents named the following as the main reasons: the use of antibiotics without a prescription (87.8% of respondents), their excessive use (80.1%), and non-compliance by patients with the course of treatment (77.8%). Analysis of the responses shows that respondents sometimes prescribe antibiotics from the watch and reserve groups (53.4% and 29%, respectively), regularly prescribe antibiotics without a prescription (14%), use injectable antibiotics (21% of respondents); 54.3% note that patients often take antibiotics on their own.

Conclusions: The survey results show that antimicrobial resistance is a serious problem in the primary healthcare system. Primary care physicians often do not follow recommendations for selecting and prescribing antibiotics. Effectively solving the problem requires a comprehensive approach, which should include improving antibiotic stewardship, increasing the level of knowledge of medical professionals, and widely informing the population about their proper use.

KEY WORDS: antimicrobial resistance, antibiotics prescription, antibiotic stewardship, primary health care

INTRODUCTION

Universal health coverage is one of the world's key sustainable development goals. The World Health Organization (WHO) believes that its achievement is impossible without ensuring access to appropriate antimicrobial treatment and reducing the risks of the emergence and spread of antimicrobial resistance (AMR) [1].

It has been established that most antibiotics are prescribed in primary healthcare (PHC) facilities, as this is where doctors are most likely to encounter bacterial infections that are treatable with these drugs [2]. According to the US Centers for Disease Control and Prevention, in 2022, 80-90% of patients receive antibiotics in outpatient settings [3], with at least 30% of such prescriptions being unjustified [4]. The WHO report "Antimicrobial Resistance and Primary Health Care" [5] highlights the two-way relationship between PHC and the development of AMR. On the one hand, quality PHC provision helps reduce the unreasonable use of antibiotics through infection prevention, rational drug prescribing, and monitoring of treatment adherence. On the other hand, with shortcomings in the work of the PHC system (overprescription of antibiotics, use of broad-spectrum drugs, and insufficient monitoring of treatment), PHC can contribute to the spread of AMR.

In Ukraine, active work on optimizing the use of antibiotics began relatively recently in connection with the growing threat of AMR. The main regulatory documents in this area are the Government Decree of 06.03.2019 No. 116-r on the approval of the National Action Plan to Combat AMR, orders of the Ministry of Health of Ukraine dated 03.08.2021 No. 1614 "On the organization of infection prevention and infection control in healthcare facilities and institutions providing social services/social protection of the population" and dated 23.08.2023 No. 1513 "On approval of the Medical Care Standard "Rational use of antibacterial and antifungal drugs for therapeutic and prophylactic purposes." However, no regulatory acts currently exist in Ukraine
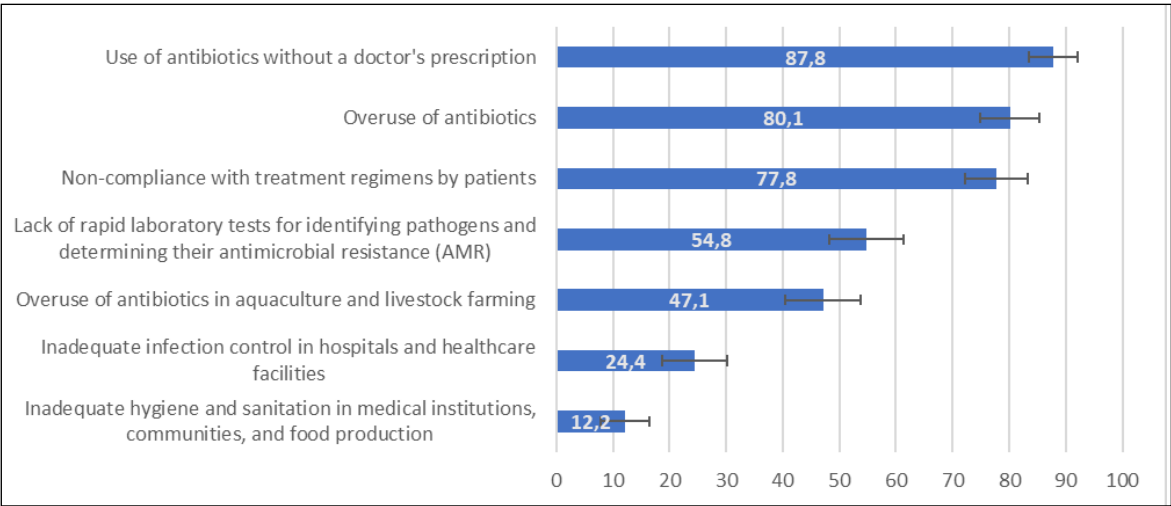
Fig. 1. Contributing factors to antimicrobial resistance as reported by primary health care physicians (%, 95% CI)

regulating antibiotic stewardship in PHC facilities and their consumption.

AIM

To assess the level of awareness regarding the problem of antibiotic resistance and identify the main obstacles to ensuring the rational use of antibiotics in the practice of primary care physicians.

MATERIALS AND METHODS

The sociological survey of doctors in PHC facilities was conducted using a specially developed questionnaire to study the practice of antibiotic therapy. The structured questionnaire contained questions related to knowledge and self-assessment of the practice of prescribing antibiotic therapy in the PHC system, the state of antibiotic stewardship at the primary level, as well as ways to solve the problem of AMR. The questionnaire was available to any member of the Family Medicine Association registered on the social network Facebook. The questionnaires were filled out by doctors once during January 2025.

The minimum required sample size was 184 people, and 221 doctors were interviewed. Among those interviewed, 82.4% were women, 17.6% were men. The average age of the respondents was 52 (37-62) years. By specialty – 80.5% of the respondents were general practitioners, 12.7%) – doctors of other specialties, and 5.0% – health care managers. The average work experience of the involved specialists was 19 (6-34) years. The majority of respondents (73.8%) served urban residents, 26.2% – rural residents.

The Biomedical Ethics Commission of the Dnipro State Medical University concluded that the study complies with the principles of bioethics and medical deontology (protocol No. 25 of February 19, 2025).

Statistical analysis was performed using STATISTICA 6.1 software (StatSoftInc., Serial number AGAR909E-415822FA). Asymmetric distribution was described by median and interquartile range (25%; 75%). For relative values, a 95% confidence interval (CI) was determined by the adjusted Wald method. Differences were assessed by the Mann-Whitney test (unrelated samples) and Pearson chi-square test ($\chi 2$) for nominal characteristics. The relationship between variables was determined by Spearman's correlation coefficient (r_s). The critical value of statistical significance for all types of analysis was taken at the level of $p<0.05$.

RESULTS

Among all respondents, 90.5% (86.6–94.4) consider AMR a significant problem in the modern healthcare system. No significant differences in views between different groups of respondents (general practitioners, doctors of other specialties, health care managers) were recorded ($p>0.05$). Almost all respondents (87.8%; 83.5–92.1) have encountered cases of ineffective antibiotic treatment of infectious diseases and their complications. Frequent manifestations of AMR (within 20–40% of all cases of antibiotic treatment) were noted by 19.0% (13.8–24.2) of respondents, not very frequent (in 10–15% of cases) – 38.0% (31.6–44.4), and rare (in 5% of cases and less) – 30.8% (24.7–36.9).

Most respondents named several factors contributing to the development of AMR. Among the most common, respondents highlighted (Fig. 1): the use of antibiotics without a doctor's prescription (87.8%; 83.5-92.1), their excessive use (80.1%; 74.8-85.4), and patients' failure to comply with the recommended course of treatment
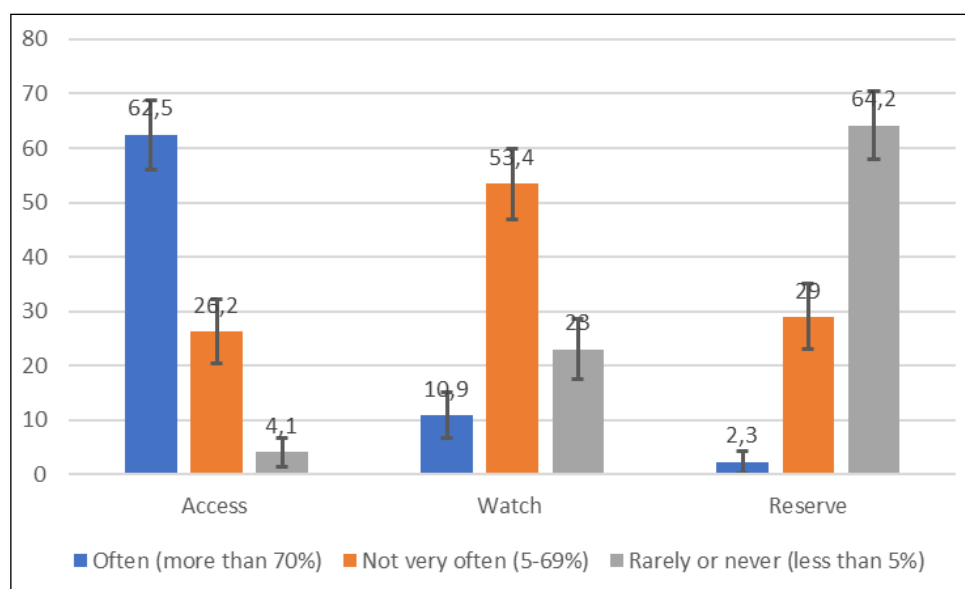
Fig. 2. Frequency of antibiotic use by primary care doctors as the starting antibacterial therapy from different groups (access, watch, and reserve) (based on survey data %; 95% CI)
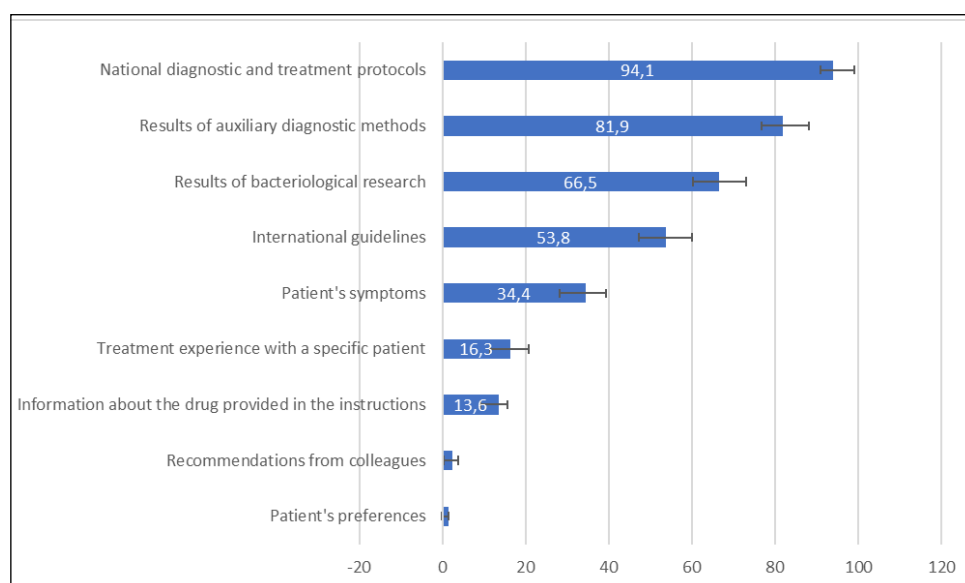

Fig. 3. Factors influencing antibiotic prescribing decisions by primary health care physicians (%, 95% CI)

(77.8%; 72.3-83.3). In addition, more than half of respondents (54.8%; 48.2-61.4) drew attention to the lack of rapid and convenient laboratory tests for identifying the causative agent of the disease.

The vast majority of respondents (84.6%; 79.8-89.4) stated that they are familiar with and use the WHO-adopted "Access, Watch, and Reserve" (AWaRe) classification of antibiotics in their practice [6], which was approved by the medical care standard for the rational use of antibacterial drugs (hereinafter – the Standard) [7]. At the same time, respondents noted that at the PHC level, antibiotics from all three groups are used as started antibacterial therapy, although with different frequencies (Fig. 2). Differences in the frequency of prescribing antibiotics from different groups by PHC doctors are significant (= 25.71; p = 0.0003) about 2/3 of respondents often prescribe antibiotics from the access group and rarely or never prescribe antibiotics from the

reserve group (62.5%; 56.1-68.9 and 64.2%; 57.9-70.5, respectively). Antibiotics from the watch group are often and not very often prescribed by a significant proportion of respondents (64.3 %; 58.0-70.6). No correlations between the results obtained and the characteristics of the respondent group (gender, age, specialty, territorial affiliation of the attached contingent) were found (r_s >0.05). The declared frequency of prescribing antibiotics from different groups corresponds to the general vector of antibiotic use but differs significantly from that recommended by the Standard.

According to the respondents, the selection and prescription of antibacterial drugs by the attending physician are almost always carried out following the approved national protocols for the diagnosis and treatment of diseases (94.1%), taking into account the results of auxiliary examination methods (radiological, laboratory, etc.) (81.9%), the results of bacteriological
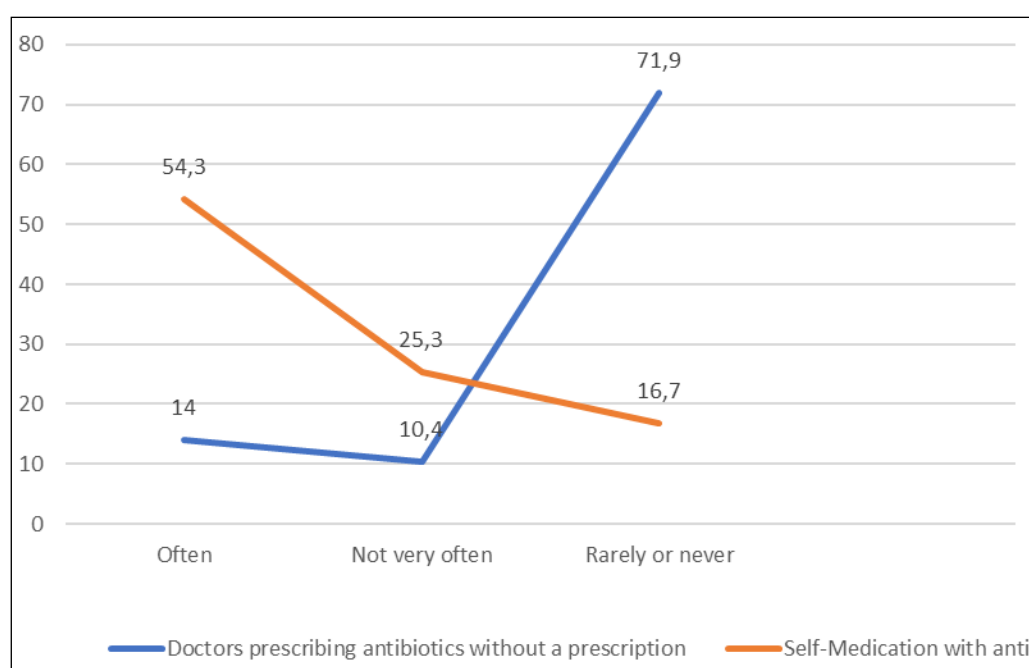
Fig. 4. Frequency of doctors prescribing antibiotics without a prescription and patients self-medication with antibiotics according to respondents

examination (66.5%), international recommendations (53.8%) and patient symptoms (34.4% of respondents) are also taken into account. Recommendations of colleagues and wishes of patients practically do not affect the prescription of antibiotics (Fig. 3). More than half of respondents (58.2%; 51.7-64.7) take into account the patient's socioeconomic status when prescribing antibiotics.

The success of treatment and the appropriateness of the decision to continue it is assessed 48-72 hours after antibiotic administration by 41.2% (34.7-47.7) of respondents. The rest use different terms to assess the success of the prescribed treatment, most often 72 hours after the appointment (48.0%; 41.4-54.6 respondents), which may be late in the case of progressive deterioration of the patient's clinical condition. In the absence of the expected result from taking an antibiotic or in the event of adverse reactions during treatment in a patient taking an antibiotic, the vast majority of study participants (86.0%; 81.4-90.6) chose the tactic of replacing the drug. The results of our study show that only a third of physicians (33.5%; 27.3-39.7) never prescribe two or more antibiotics to patients at the same time, and every fifth (20.8%; 15.4-26.2) uses intramuscular injectable forms of antibacterial drugs. It is worth noting that the frequency of responses regarding the prescription of injectable antibiotics shows a certain connection with the place of residence of patients – in rural areas more often than in urban areas (r_s =0.27; p <0.05).

All respondents noted that antibacterial drugs are prescribed to patients by filling out prescription forms in electronic or paper form. At the same time, 18.1% (13.0-23.2) of the surveyed doctors indicated that they also provide patients with written recommendations on taking antibiotics without a prescription, which is prohibited by the Standard and in some way blurs the procedure for prescribing antimicrobial drugs.

When asked directly about doctors prescribing antibiotics without a prescription, 54.8% (48.2-61.4) of respondents answered positively, and 14.0% (9.4-18.6) indicated that they do so regularly. The situation is also complicated by the fact that patients take antibiotics on their own. The statement that people prescribe antibacterial therapy to themselves without consulting a doctor was supported by 96.4% (93.9-98.9) of respondents, and more than half (54.3%; 47.7-60.9) indicated that such cases occur often (in 20-40% of situations) (Fig. 4).

Only 25.3% (19.6-31.0) of respondents noted that they regularly receive complete and detailed information about antibiotics prescribed to patients from other healthcare facilities. At the same time, 18.1% (13.0-23.2) of respondents reported a complete lack of access to such data, and others received information fragmentarily or in a limited volume.

Most of the surveyed doctors (89.6%; 85.6-94.6) believe that they sufficiently explain to patients the prescription, choice of antibiotics, and procedure for their use. Consultations take place both during personal appointments and remotely, using the phone (73.3%; 67.5-79.1 respondents), messengers (Viber, Telegram, WhatsApp) (59.7%; 53.2-55.2), and in some cases – telemedicine consultations (11.3%; 7.1-15.5).

At the same time, respondents do not see a connection between informing patients and their adherence to prescribed antibiotic treatment (according to the Mann-Whitney U-test p>0.05). Only 42.5% (36.0-49.0) of

Table 1. Measures to increase the effectiveness of antibiotic therapy and prevent AMR at the PHC level (respondents' suggestions, %; 95% CI)

Suggestions	% of respondents (95% CI)
Increase the level of knowledge of medical personnel regarding the rational use of antibiotics	61.5 (55.1-67.9)
Ensure that antibiotics are prescribed to patients only in cases of proven need	75.1 (69.4-80.8)
Strengthen control over the prescription of antibiotics	50.2 (43.6-56.8)
Increase patient awareness and understanding of antibiotic compliance and the dangers of their misuse	51.1 (44.5-57.7)
Develop and implement a standard operating procedure for PHC facilities regarding antibiotic stewardship	31.2 (25.1-37.3)

doctors reported that patients fully followed the course of treatment, 55.7% (49.1-62.3) noted partial violation of recommendations, and 1.8% (0.5-3.5) noted that patients completely ignored the doctor's prescription.

Antibiotic stewardship in the PHC sector remains generally disorganized. Among respondents, 58.4% (51.9-64.9) believe that responsibility for the rational use of antibiotics lies with physicians, 8.6% (4.9-12.3) with medical directors, and 29.9% (23.9-35.9) indicated responsibility for several officials in various combinations (e.g., physicians and medical directors, etc.).

Respondents proposed several measures to increase the effectiveness of antibiotic therapy and prevent AMR at the primary level (Table 1). Among these, the most prominent were: enhancing the professional development of medical personnel (both in theoretical knowledge and practical application), raising public awareness about the importance of responsible antibiotic use, and implementing organizational strategies to support antibiotic stewardship.

DISCUSSION

As a result of the study of the views of PHC physicians on the use of antimicrobial drugs in their practice, three key conclusions were made: 1) physicians are aware of the importance of the AMR problem in PHC; 2) they are generally familiar with the recommendations on the selection and use of antibiotics for the treatment of common infections; 3) however, in practice, these recommendations are often violated.

Among the surveyed doctors, 90.5% recognize AMR as one of the biggest problems of modern healthcare, and 88% have encountered ineffective antibiotic therapy in practice. The main factors contributing to AMR development in the PHC system align with the list of causes identified in a special WHO report [5], suggesting a strong understanding of the key drivers of resistance.

Most doctors do not always adhere to the Standard for selecting antibiotics, which stipulates that at the PHC level, at least 95% of patients should receive antibiotics from the Access group, no more than 5% from the

Watch group, and the prescription of antibiotics from the Reserve group is not provided for at all [7]. However, according to survey data confirmed by analytical studies of the pharmaceutical market [8], antibiotics from all three groups are used in the PHC sector, with the consumption of Watch and Reserve group drugs remaining significant.

The study also identified several shortcomings in antibiotic prescribing within the PHC system. Specifically, 14% of doctors regularly prescribe antibiotics without a prescription; 21% use injectable antibiotics; and 66.5% sometimes prescribe multiple antibiotics to treat a bacterial infection of a single localization, which is prohibited by the Standard.

Only 41.2% of doctors assess the effectiveness of antibiotic therapy according to recommendations – within 48-72 hours.

Insufficient information sharing between primary care and other healthcare settings hinders effective antibiotic stewardship. In particular, the flow of information about prescribed antibiotics is often incomplete and inconsistent. Our survey found that only 25% of respondents receive comprehensive information about their patients' antibiotic regimens from other healthcare settings, indicating a significant communication gap that can negatively impact outcomes and contribute to the development of antibiotic resistance.

Additionally, 57.5% of doctors reported low patient adherence to antibacterial treatment, and 54.3% believe that patients often self-medicate with antibiotics, which is a significant factor in the development of adverse reactions and increased AMR [9].

Respondents were unable to identify facility officials are responsible for the rational use of antimicrobials, indicating a lack of clear coordination and administration of antibiotic stewardship in the PHC system.

The measures proposed by participants to prevent antibiotic resistance align with WHO recommendations from the 2023 country self-assessment on antibiotic resistance, particularly regarding the need for primary-level antibiotic stewardship [10]. Doctors in our study also emphasized professional development for

medical staff and patient education on responsible antibiotic use.

LIMITATIONS AND PERSPECTIVES
The sample for this study was gathered through social networks, which limits its representativeness since not all doctors have access to or use these platforms. Additionally, the short timeframe for implementing systemic measures to reduce the frequency of anti-microbial resistance (AMR) in the country does not allow for a reliable assessment of their impact on treatment practices among primary care physicians.

Longitudinal studies are necessary to monitor these changes over time.

CONCLUSIONS
The survey results show that antimicrobial resistance is a serious problem in the primary healthcare system. Primary care physicians often do not follow recommendations for selecting and prescribing antibiotics. Effectively solving the problem requires a comprehensive approach, which should include improving antibiotic stewardship, increasing the level of knowledge of medical professionals, and widely informing the population about their proper use.

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CONFLICT OF INTEREST
The Authors declare no conflict of interest

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