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## AWARENESS ASSESSMENT OF EAST KAZAKHSTAN REGION POPULATION ON THE ANTIBIOTICS USE

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### Abstract

**Background:** The acquisition of drug resistance by microorganisms narrows the possibilities for the treatment of diseases that these microorganisms cause. The emergence of antimicrobial resistance is observed all over the world and in a wide range of microorganisms. The prevalence of this phenomenon is growing and threatens the health of both humans and animals. The immediate consequences of infection with resistant microorganisms can be serious, including a longer course of the disease, increased mortality, longer hospitalization, weaker protection of patients from infection during operations and other medical procedures, as well as an increase in the cost of treatment. Antimicrobial resistance has implications for all areas of health care and a wide variety of sectors, affecting society as a whole.

**Materials and Methods:** A cross-sectional study of knowledge, attitudes and use of antibiotics was conducted among 727 people without medical education and over 18 years of age from October 2021 to March 2022 in East Kazakhstan region according to the WHO questionnaire «Antibiotic resistance: multi-country public awareness survey».

**Results:** 20.2% of respondents took antibiotics over the past 6 months, 21.7% over the past month. 52% said they received a prescription for antibiotics from a doctor, 35% without a prescription and 13% did not remember. 28.3% of those surveyed believe that it is necessary to stop taking antibiotics when they feel better. 41% of residents said that when they get sick again with the same symptoms, they will buy or ask their doctor again for an antibiotic that has helped them last.

**Conclusion:** According to the results of the respondents' responses, it can be concluded that the knowledge of the population about antibiotics is insufficient and it is necessary to increase public awareness of these drugs both by public health specialists and at the primary level.

**Keywords:** antibiotics, antibiotic resistance, knowledge about antibiotics, use of antibiotics, attitude to antibiotics.

### Резюме

## ОЦЕНКА ИНФОРМИРОВАННОСТИ НАСЕЛЕНИЯ ВОСТОЧНО-КАЗАХСТАНСКОЙ ОБЛАСТИ ОБ ИСПОЛЬЗОВАНИИ АНТИБИОТИКОВ

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**Введение.** Приобретение микроорганизмами устойчивости к лекарственным средствам сужает возможности для лечения болезней, которые эти микроорганизмы вызывают. Возникновение устойчивости к противомикробным препаратам наблюдается во всем мире и у широкого спектра микроорганизмов. Распространенность этого явления

растет и угрожает здоровью как людей, так и животных. Непосредственные последствия инфицирования резистентными микроорганизмами могут быть серьезными, включая более длительное течение болезни, повышенную смертность, более длительную госпитализацию, более слабую защиту пациентов от инфицирования во время операций и других медицинских процедур, а также увеличение стоимости лечения. Устойчивость к противомикробным препаратам имеет последствия для всех областей здравоохранения и самых разных секторов, влияя на общество в целом.

**Материалы и методы исследования:** В период с октября 2021 года по март 2022 года было проведено перекрестное исследование знаний, отношения и использования антибиотиков среди 727 жителей Восточно-Казахстанской области без медицинского образования и старше 18 лет в соответствии с вопросником ВОЗ «Устойчивость к антибиотикам: многострановое исследование осведомленности общественности».

**Результаты:** 20,2% респондентов принимали антибиотики за последние 6 месяцев, 21,7% - за последний месяц. 52% сказали, что получили рецепт на антибиотики от врача, 35% - без рецепта и 13% ответили, что не помнят. 28,3% опрошенных считают, что необходимо прекратить прием антибиотиков, когда они почувствуют себя лучше. 41% жителей заявили, что, когда они снова заболеют с теми же симптомами, они купят или снова попросят у своего врача антибиотик, который помог им в прошлом.

**Вывод:** По результатам ответов респондентов, можно сделать вывод, что знания населения об антибиотиках недостаточны и требуется повышения осведомленности населения об этих препаратах как со стороны специалистов общественного здравоохранения, так и на уровне первичного звена.

**Ключевые слова:** антибиотики, устойчивость к антибиотикам, знания об антибиотиках, применение антибиотиков, отношение к антибиотикам.

Түйіндеме

## ШЫҒЫС ҚАЗАҚСТАН ОБЛЫСЫ ТҰРҒЫНДАРЫНЫҢ АНТИБИОТИКТЕРДІ ҚОЛДАНУ ТУРАЛЫ АҚПАРАТТАНУЫН БАҒАЛАУ

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**Кіріспе.** Микроорганизмдердің дәрілік заттарға төзімділігін алу осы микроорганизмдер тудыратын ауруларды емдеу мүмкіндіктерін тарылтады. Микробқа қарсы тұрақтылықтың пайда болуы бүкіл әлемде және микроорганизмдердің кең ауқымында байқалады. Бұл құбылыстың таралуы өсіп, адамдар мен жануарлардың денсаулығына қауіп төндіруде. Төзімді микроорганизмдермен инфекцияның салдары ауыр болуы мүмкін, соның ішінде аурудың ұзағырақ ағымы, өлім-жітімнің жоғарылауы, ауруханаға жатқызудың ұзағырақ болуы, операциялар мен басқа да медициналық процедуралар кезінде пациенттерді инфекциядан әлсіз қорғау және емдеу құнының артуы. Микробқа қарсы препараттарға төзімділік денсаулық сақтаудың барлық салаларына және әртүрлі секторларына, жалпы қоғамға әсер етеді.

**Материалдар мен әдістер:** ДДҰ-ның "Антибиотиктерге төзімділік: тұрғындардың ақпараттануын көп елдік зерттеу" сауалнамасына сәйкес Шығыс Қазақстан облысында медициналық білімі жоқ және 18 жастан асқан 727 адам арасында 2021 жылдың қазан айынан 2022 жылдың наурыз айына дейін антибиотиктердің білімін, көзқарасын және қолданылуын өзара зерттеу жүргізілді.

**Нәтижелері:** Респонденттердің 20,2% - ы соңғы 6 айда антибиотиктерді, 21,7% - ы соңғы айда қабылдады. 52% - ы дәрігерден антибиотиктерге рецепт алғанын, 35% - ы рецептсіз және 13% - ы есінде жоқ екенін айтты. Сауалнамаға қатысқандардың 28,3% - ы өздерін жақсы сезінген кезде антибиотиктерді қабылдауды тоқтату керек деп санайды. Тұрғындардың 41% - ы дәл осындай белгілермен қайтадан ауырған кезде дәрігерден бұрын көмектескен антибиотик сатып алатынын немесе сұрайтынын айтты.

**Қорытынды:** Респонденттердің жауаптарының нәтижелері бойынша халықтың антибиотиктер туралы білімі жеткіліксіз және қоғамдық денсаулық сақтау мамандары да, бастапқы деңгейде де осы препараттар туралы халықтың ақпараттануын арттыру қажет деген қорытынды жасауға болады.

**Түйінді сөздер:** антибиотиктер, антибиотиктерге төзімділік, антибиотиктер туралы білім, антибиотиктерді қолдану, антибиотиктерге деген көзқарас.

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**Introduction**

Currently, the consumption of medicines by a person significantly increased [9]. Pharmaceutical preparations are an integral part of the diet human nutrition around the world [2]. Among them are products antibiotics all used drug treatment strategies, as they are necessary for treatment and faster recovery from any disease. However among the population and health professionals, there are some misconceptions associated with the use of antibiotics [5]. With this in mind misconceptions, inappropriate and excessive use antibiotics can be used by ordinary people, sometimes medical professionals can lead to adverse events harm the patient and accelerate the growth of resistance to microorganisms many effective antibiotics include [1, 10, 13]. Antibiotic resistance poses a serious threat to society health and safety around the world. To stop antibiotic resistance, WHO set the topic: "No action today, no treatment tomorrow" [14]. The irrational use of antibiotics causes it is necessary to take measures to alarm and prevent antibiotic resistance. The global problem of antibiotic resistance it was formed due to many factors related to inappropriate, uncontrollable prevalence and use of antibiotics [15]. Therefore, management and proper provision of the general public training of medical personnel on antibiotics it is necessary to control their irrational use [11, 15]. Each member of the medical team plays a certain role in antibiotic management. Pharmacists play important role as outpatient and drug dispatchers inpatient patients in inpatient facilities [3]. Reasonable use medicines for the prevention and treatment of diseases are mainly dependent on from the results of clinical laboratory diagnostics of the patient developed by a clinical laboratory assistant [8]. Nurses various therapeutic drugs are prescribed and plays an important role in patient training [6]. Thus, among these health professionals, educational initiatives on the effective and responsible use of antibiotics should be promoted [7]. Future medical workers should receive relevant higher education in antibiotic management, development of relevant knowledge about antibiotics, their use and resistance to antibiotics [12]. However, not enough higher education in antibiotic management promoting clinical negligence in the use of antibiotics, this has serious consequences for the health of patients [4].

**Aim of study:** To assess the level of knowledge of the population about the use of antibiotics.

**Materials and Methods***Study design and area*

A cross-sectional study was conducted among the population of East Kazakhstan region without medical education from October 2021 to March 2022. A total of 727

respondents were included in the study after sample size estimation.

*Data collection tool and procedure*

In addition to general and demographic characteristics like age, sex, residence, and marital status, other variables were captured such as employment, and education level. Knowledge concerning the use of antibiotics was assessed using questions adapted from a validated WHO questionnaire used in a multi-country survey. The final questionnaire consisted of 27 questions covering: 1) awareness and ownership of AMR; 2) knowledge, attitude and history on antibiotic use; and 3) views on potential control measures and AMR-related health promotion.

The tool used that was developed in Kazakh and Russian. The time used to fill in the questionnaire ranged from 15 to 20 min. The objectives of the study were explained clearly to the participants before data collection. The privacy of respondents was assured by not asking their identity information such as their name, employee identity numbers in the questionnaire. We used all data for the purpose of the research, and they were encrypted and stored electronically in a secure location, with a password used by the principal investigator to ensure privacy and confidentiality. Informed consent was obtained from each participant, and then a structured questionnaire was distributed to collect all the data.

*Ethical considerations*

Ethical clearance for this study was granted by the Semey medical university ethics committee, protocol No.2, 28.10.2020. Permission to conduct the study were obtained from the participants prior to interview.

*Data analysis:*

Data were entered in a database and cleaned before checked for completeness. Data were then analyzed using the Statistical Package for Social Sciences (SPSS) version 20. The age profile of participants was summarized by calculating the median age and the interquartile range in years. Categorical variables including the general characteristics of participants (sex, marital status, education level, employment), knowledge about the use of antibiotics and responses on questions about the use of antibiotics in different conditions, were summarized using frequencies and percentages.  $P < 0.05$  were considered statistically significant. Associations between selected demographic information and responses to selected questions were examined by Kruskal-Wallis test.

**Results**

To more clearly characterize the quantitative relationship between gender, place and place of residence, level of education, family composition, age and income with

the respondent's answer option (Yes, No, I don't remember), the relative risk values (RR) of the presented predictors were calculated using a multinomial logistic regression. Each block provides information for understanding the reliable significance of the quantitative influence of a predictor (independent variable) on the variable under study. So, in the first block "Yes", the most statistically reliable predictors of the respondent's response are the level of education (HR=1.28; z=2.91; p≤0.004) and income (HR=2.07; z=3.63; p≤0.0001). The remaining

factors are weak predictors of the answer "Yes" and their relative risk ranges from – 0.85-1.13 (p≥0.05). In the second "No" block, the statistically reliable predictors of the respondent's response (HR=0.62; z=-2.26; p≤0.02) are the area of residence and income (HR=2.05; z=3.49; p≤0.001). Thus, there is a direct relationship between the response variant and the identified predictors in the study group of people (Wald  $\chi^2 = 61.8$ ; p≤0.0001). The remaining predictors are much less powerful than those listed above and are statistically unreliable (p≥0.05) (Table 1).

Table 1.

**Comparative assessment of the quantitative impact of some biological, socio-economic and other factors on the respondent's response to the question of obtaining antibiotics (or a prescription for them) from a doctor or nurse based on multinomial logistic regression (relative risk).**

Factors	Relative risk	±m	z	P≥ z	[95% Confidence interval]	
<b>Yes</b>						
sex	1,07	0,31	0,22	0,82	0,60	1,89
place of residence	1,01	0,03	0,48	0,63	0,95	1,07
location	0,85	0,17	-0,82	0,41	0,57	1,25
education level	1,28	0,11	2,91	0,004**	1,08	1,50
family composition	1,09	0,07	1,45	0,14	0,96	1,24
age	1,13	0,18	0,78	0,43	0,82	1,56
income	2,07	0,42	3,63	0,0001***	1,39	3,07
<b>No</b>						
sex	0,58	0,17	-1,86	0,06	0,32	1,03
place of residence	1,05	0,03	1,50	0,13	0,98	1,10
location	0,62	0,13	-2,26	0,02*	0,40	0,93
education level	1,15	0,10	1,59	0,11	0,96	1,37
family composition	0,95	0,06	-0,71	0,47	0,83	1,08
age	1,008	0,17	0,05	0,96	0,71	1,41
income	2,05	0,42	3,49	0,001**	1,37	3,07

Note:  $n() = 727$ ; LR  $\chi^2 = 61,8$ ;  $p \leq 0,0001$ ;  $R^2 = 0,04$

In a comparative analysis between the percentage distribution of respondents' answers in the context of the level of education, a statistically significant relationship was found (p≤0.01) between incomplete secondary education and the answer "I don't remember" (32.3%) with a calculated relative risk of 3.62. In addition, respondents with a master's degree and PhD answered this question affirmatively "Yes" – 69.8% - 71.4% with statistical confidence (p<0.05) and relative risk – 2.22 and 2.29, respectively. In other cases, there was a uniform percentage distribution in the responses of respondents with calculated values of relative risk in the range – 0.34 – 1.92 (p≥0.05). The Kraskel-Wallis analysis of variance (14.08; p≤0.001) helped to conclude that the higher the respondent's level of education, the more the answer to this question tends to "Yes".

The relationship between the quantitative characteristics of the answer of respondents in the East Kazakhstan region to the question of getting advice from a

doctor, nurse or pharmacist on how to take them and their level of education is shown in Table 2.

When comparing the percentage distribution in answers of respondents by level of education, a statistically significant relationship was found (p≤0.0001-0.05) between incomplete and complete secondary education, and the answer "I don't remember" (41.9% and 21.9%) with the calculated relative risk – 5.12 and 2.16. However, respondents with a PhD degree on this question the affirmative answer was "Yes" - 71.4% with statistical confidence (p≤0.05) and relative risk – 2.38. In other cases, there was a uniform percentage distribution in the responses of respondents with calculated values of relative risk in the range – 0.35 – 1.48 (p≥0.05). The Kraskel-Wallis analysis of variance (20.01; p≤0.0001) helped to conclude that the higher the respondent's level of education, the more the answer to this question tends to "Yes" and, conversely, the lower the level of education, the respondent's answer tends to "I don't remember".

Table 2.

Characteristics of the response of respondents of the East Kazakhstan region to the question "Have you received advice from a doctor, nurse or pharmacist on how to take them" in the context of the level of education

Indicators			Consultation from a doctor, nurse or pharmacist			Total
			Yes	No	I don't remember	
Education level	No schooling completed	abs.no	13	5	13	31
		% by line	41,9%	16,1%	41,9%***	100,0%
		% by column	3,5%	2,0%	13,1%	4,3%
		Total %	1,8%	0,7%	1,8%	4,3%
	High school graduate with diploma/qualifications	abs.no	69	49	33	151
		% by line	45,7%	32,5%	21,9%*	100,0%
		% by column	18,4%	19,3%	33,3%	20,8%
		Total %	9,5%	6,7%	4,5%	20,8%
	Some college credit, no degree	abs.no	18	17	6	41
		% by line	43,9%	41,5%	14,6%	100,0%
		% by column	4,8%	6,7%	6,1%	5,6%
		Total %	2,5%	2,3%	0,8%	5,6%
	Technical/Vocational training or Associate degree	abs.no	56	39	6	101
		% by line	55,4%	38,6%	5,9%	100,0%
		% by column	15,0%	15,4%	6,1%	13,9%
		Total %	7,7%	5,4%	0,8%	13,9%
	Bachelor's degree	abs.no	181	126	36	343
		% by line	52,8%	36,7%	10,5%	100,0%
		% by column	48,4%	49,6%	36,4%	47,2%
		Total %	24,9%	17,3%	5,0%	47,2%
Master's/Professional degree	abs.no	32	16	5	53	
	% by line	60,4%	30,2%	9,4%	100,0%	
	% by column	8,6%	6,3%	5,1%	7,3%	
	Total %	4,4%	2,2%	0,7%	7,3%	
Doctorate degree	abs.no	5	2	0	7	
	% by line	71,4%*	28,6%	0,0%	100,0%	
	% by column	1,3%	0,8%	0,0%	1,0%	
	Total %	0,7%	0,3%	0,0%	1,0%	
Total	abs.no	374	254	99	727	
	% by line	51,4%	34,9%	13,6%	100,0%	
	% by column	100,0%	100,0%	100,0%	100,0%	
	Total %	51,4%	34,9%	13,6%	100,0%	

Thus, when assessing the quantitative relationship between the subjective response of respondents in the East Kazakhstan region to the question of getting advice from a doctor, nurse or pharmacist on how to take antibiotics and their level of education, the following patterns were revealed. The critical value of  $\chi^2$  at the significance level  $p \leq 0.0001$  is 43.07, and the calculated Kramer V criteria and the conjugacy coefficient showed a weak to medium relationship between the studied variables at the level of 0.17 and 0.23, respectively.

When comparing the percentage distribution in the responses of respondents in the context of income, a uniform percentage distribution was observed with calculated values of relative risk in the range – 0.53 – 1.77

( $p \geq 0.05$ ). The Kraskel-Wallis analysis of variance (16.59;  $p \leq 0.0001$ ) showed that the relationship between income and respondents' response options is statistically reliable.

Thus, when assessing the quantitative relationship between the subjective response of respondents in the East Kazakhstan region to the question "Antibiotic resistance occurs when your body becomes resistant to antibiotics and they stop acting" and their income level, the following patterns were identified. The critical value of  $\chi^2$  at the significance level  $p \leq 0.001$  is 19.5, and the calculated criteria of Kramer's V and the conjugacy coefficient showed a weak relationship between the studied variables at the level of – 0.12 and 0.16, respectively.

The relationship between the quantitative characteristics of the response of respondents of the East Kazakhstan region to the question of antibiotic resistance

arises when your body becomes resistant to antibiotics, and they cease to act and age is shown in Table 3.

Table 3.

**Characteristics of the response of respondents of the East Kazakhstan region to the question "Antibiotic resistance occurs when your body becomes resistant to antibiotics and they cease to act" in the context of age.**

Indicators			Antibiotic resistance			Total
			True	False	Don't know	
Age	18-24 years	abs.no	130	87	221	438
		% by line	29,7%	19,9%*	50,5%	100,0%
		% by column	52,6%	74,4%	60,9%	60,2%
		Total %	17,9%	12,0%	30,4%	60,2%
	25-44 years	abs.no	92	14	80	186
		% by line	49,5%*	7,5%	43,0%	100,0%
		% by column	37,2%	12,0%	22,0%	25,6%
		Total %	12,7%	1,9%	11,0%	25,6%
	45-65+ years	abs.no	25	16	62	103
		% by line	24,3%	15,5%	60,2%	100,0%
		% by column	10,1%	13,7%	17,1%	14,2%
		Total %	3,4%	2,2%	8,5%	14,2%
Total	abs.no	247	117	363	727	
	% by line	34,0%	16,1%	49,9%	100,0%	
	% by column	100,0%	100,0%	100,0%	100,0%	
	Total %	34,0%	16,1%	49,9%	100,0%	

When comparing the percentage distribution in the responses of respondents by age, a statistically significant relationship was found ( $p \leq 0.05$ ) between the level of "25-44 years" and the answer "True" (49.5%) with a calculated relative risk of 2.44 and the age of "18-24 years" and the answer "Incorrect" (19.9%) with a relative risk of 2.14 at  $p \leq 0.05$ . In other cases, there was a uniform percentage distribution in the responses of respondents with calculated values of relative risk in the range – 0.35 – 1.62 ( $p \geq 0.05$ ). Kraskel-Wallis analysis of variance (9.38;  $p \leq 0.009$ ) helped to conclude that the younger the age of the respondent, the more the answer to this question tends to "Wrong".

Thus, when assessing the quantitative relationship between the subjective response of respondents in the East Kazakhstan region to the question "Antibiotic resistance occurs when your body becomes resistant to antibiotics and they stop acting" and their age, the following patterns were identified. The critical value of  $\chi^2$  at the significance level  $p \leq 0.0001$  is 34.7, and the calculated Kramer V criteria and the conjugacy coefficient showed a weak relationship between the studied variables at the level of 0.16 and 0.21, respectively.

Analyzing the percentage distribution of respondents' responses by age, a statistically significant relationship was found ( $p \leq 0.01-0.05$ ) between the level of "45-65+ years" and the answers "Strongly disagree" (4.9%) with the calculated relative risk – 2.22, "To some extent disagree" (8.7%; 3.89) and "I am neutral" (17.5%; 1.99). In other cases, there was a uniform percentage distribution in the responses of respondents with calculated values of relative risk in the range – 0.44 – 1.76 ( $p \geq 0.05$ ). Kraskel-Wallis analysis of Variance (22.41;  $p \leq 0.0001$ ) helped to conclude that the older the age of the respondent, the more the answer to this question tends from "Strongly disagree" to "I am neutral".

When comparing the percentage distribution in the responses of respondents by level of education, a statistically significant relationship was found ( $p \leq 0.0001$ ) between incomplete secondary education and the answer "Categorically disagree" (29.0%) with the calculated relative risk – 13.83. However, respondents with a bachelor's degree answered this question in the affirmative "To some extent disagree" - 3.8% with statistical reliability ( $p \leq 0.01$ ) and relative risk – 2.99; master's degree - "To some extent agree" - 22.6% with statistical reliability ( $p \leq 0.05$ ) and relative risk – 1.98; and PhD - "To some extent I agree" - 28.6% with statistical reliability ( $p \leq 0.01$ ) and relative risk – 2.57. In other cases, there was a uniform percentage distribution in the responses of respondents with calculated values of relative risk in the range – 0.19 – 1.77 ( $p \geq 0.05$ ). The Kraskel-Wallis analysis of variance (24.16;  $p \leq 0.0001$ ) helped to conclude that the higher the respondent's level of education, the more the answer to this question tends to "To some extent agree" and, conversely, the lower the level of education, the respondent's answer tends to "Categorically disagree".

When comparing the percentage distribution in the responses of respondents by level of education, a statistically significant relationship was found ( $p \leq 0.001$ ) between incomplete secondary education and the answer "To some extent disagree" (32.3%) with the calculated relative risk - 10.22. However, respondents with a bachelor's degree answered this question in the affirmative "Categorically disagree" - 6.7% with statistical reliability ( $p \leq 0.05$ ) and relative risk – 2.05; master's degree - "To some extent agree" - 32.1% with statistical reliability ( $p \leq 0.05$ ) and relative risk - 2.12; and PhD - "Totally agree" - 71.4% with statistical reliability ( $p \leq 0.01$ ) and relative risk – 3.54. In other cases, there was a uniform percentage distribution in the responses of respondents with calculated

values of relative risk in the range – 0.15 – 1.64 ( $p \geq 0.05$ ). The Kraskel-Wallis analysis of variance (17.41;  $p \leq 0.002$ ) helped to conclude that the higher the respondent's level of education, the more the answer to this question tends to "Completely agree" and, conversely, the lower the level of education, the respondent's answer tends to "To some extent disagree".

**Conclusion.** The irrational use of antibiotics is alarming, and steps must be taken to prevent antibiotic resistance. The global issue of antibiotic resistance has developed due to multiple factors related to inappropriate, unsupervised, and uncontrolled dispensing and use of antibiotics. Hence, guiding the general public and providing proper training to healthcare professionals on antibiotics are necessary to control its irrational usage.

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