

## ANTIBIOTICS FOR UPPER RESPIRATORY INFECTIONS: PUBLIC KNOWLEDGE, BELIEFS AND SELF-MEDICATION IN THE REPUBLIC OF MACEDONIA

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### Abstract

Self-medication as part of the irrational use of antibiotics contributes to the spread of antimicrobial resistance. The aim of this community-based survey in Macedonia was to determine public knowledge, beliefs and self-medication with antibiotics for upper respiratory infections. A cross-sectional study was conducted in three administrative regions in Macedonia in April 2012. 402 eligible participants answered an anonymous questionnaire. The analysis of answers involved descriptive quantitative statistics (frequencies and percentages). We also tested for significant associations between demographic characteristics and non-prescription use of antibiotics. Our respondents demonstrated a relatively low level of public knowledge about antibiotics and upper respiratory infection treatments in comparison to the EU countries. The study found that 71.4% of participants stored antibiotics at home, and 43.3% purchased antibiotics over-the-counter in the last year, despite national regulation that restricts antibiotics as prescription-only medicines. Actual self-medication with antibiotics for a recent upper respiratory infection episode was reported in 17.8% of adults and 1.8% of children aged 0–4 years. We did not find any significant association between participants' demography and non-prescription use of antibiotics. Our results put in the group of eastern and southern EU countries with the highest rates for non-prescription use of antibiotics in Europe. Multifaceted interventions are needed to prevent self-medication with antibiotics, including: enforcement of regulations that restrict over-the-counter sales of antibiotics, monitoring of antibiotic use and antimicrobial resistance rates and combined public education strategies.

**Key words:** antibiotics, antimicrobial resistance, self-medication, knowledge, beliefs, upper respiratory tract infections, Republic of Macedonia.

### Introduction

The emergence and spread of antimicrobial resistance (AMR) presents a serious problem for healthcare services and communities worldwide [1, 2]. The rapid increase of drug-resistant bacteria has resulted in longer, more complicated courses of treatments, greater mortality risk and extra healthcare costs [3, 4]. It is

well documented that irrational antibiotic use increases the risk of resistant strains' selection and may contribute to antibiotic resistance [5, 6]. In industrialized countries, the majority of antibiotics are prescribed in primary healthcare settings for upper respiratory tract infections (URTI), such as common cold, influenza, sinusitis, etc [6]. A substantial proportion of these

prescriptions are neither necessary nor effective. Most URTI are viral in origin, self-limiting and resolve in the same amount of time whether or not an antibiotic is prescribed [7–11].

Irrational use of antibiotics also involves self medication, i.e. using antibiotics purchased from pharmacies without prescription, or leftover antibiotics from previous courses of treatment [12]. By contrast to northern Europe and North America where antibiotics are restricted to prescription-only use, they are easily obtained over-the-counter (OTC) in the rest of the world [13]. Recent studies showed a wide variation of antibiotic self-medication among European countries; with low prevalence in northern and western Europe and high prevalence in eastern and southern Europe, particularly for URTI [12, 14]. The main causes for self-medication with antibiotics in Europe are: poor regulations of restricted prescription-only use (or inadequate enforcement of existing policies), and patients' misconceptions about the efficacy of antibiotics for minor ailments. [14].

The World Health Organization has called for global action against AMR, acknowledging the complexity of this public health crisis [15, 16]. Their comprehensive policy package addresses all stakeholders by recommending: (1) integrated monitoring of antimicrobial consumption and resistance, (2) prescriber and consumer education, and (3) regulation of antibiotic use in communities and healthcare systems [15, 16]. One important strategy for AMR control includes tailored educational interventions directed at the public [17]. In Europe, the European Antibiotic Awareness Day (EAAD) has provided a platform for national campaigns to tackle public misconceptions surrounding antibiotics, and to raise awareness of its appropriate use, particularly in URTI [17].

The Republic of Macedonia has participated in EAAD since its launch in 2008 [18]. Macedonian national regulation classifies antibiotics as prescription-only medicines [19] and includes the essential ones in the medicines reimbursement list [20]. In 2011, the Government called for the development of a national strategy on antimicrobial resistance, and its implementation is underway [21]. However, systematically collected information on resistance rates and antibiotic use, including self-

medication, is scarce in the country. Despite the existence of laws, the OTC sale of antibiotics might be expected in Macedonia, as this practice has already been documented in other South-Eastern European countries [12, 22]. Furthermore, little is known about public awareness and attitudes towards antibiotic use in the country. One multicentre pilot study indicated that Macedonian citizens had the highest willingness for self-medication with antimicrobials compared with other Balkan countries [23].

We conducted this survey to assess public knowledge, beliefs and behaviour regarding antibiotic use in adults and children, with special interest on URTI. Our corresponding objective was to identify demographic factors associated with non-prescription antibiotic use.

## Methods

### *Study population and questionnaire design*

A cross-sectional and community-based study was conducted in early April (week 14) 2012, one month after influenza reached its peak in the country [24]. The survey was carried out in three administrative regions: Eastern Region, South-eastern Region and Vardar (Central) Region. It covered a population of approximately half a million inhabitants, or about 25% of the country's population [25]. The sample size of a minimum of 400 respondents was calculated to give a 95% confidence level and 5% margin of error for an assumed 50% level of accuracy for self-medication. The selection of respondents was based on a random sampling at household level. Medical professionals, members of the same families, and respondents from other regions were excluded from the survey. Participants were adults aged 18 and older, who, where relevant, were asked to provide information on their children aged 0–4 years.

Data were collected through a structured questionnaire developed with validated questions from previous studies [26, 27]. The questionnaire was translated from English into Macedonian, and pre-tested on a small pilot population. The anonymous questionnaires were distributed by trained volunteers and completed in face-to-face interviews. Respondents' verbal consent was obtained after a briefing on the

objectives of the study. The questionnaire consisted of sections on: (1) participants' demographic and socioeconomic characteristics; (2) knowledge and beliefs regarding antibiotic use to treat upper respiratory infections; (3) sources of oral antibiotics obtained in the past year; and (4) actual behaviour during last URTI episode in the six months preceding the study. Answers to questions that determined the knowledge of antibiotic use were stated as "yes", "no", and "don't know". The answers with "don't know" were added into the incorrect one. Questions on participants' beliefs and behaviour were either "yes"/"no" questions or multiple-choice types.

#### *Statistical analysis*

Questionnaire data were checked, coded, entered into Microsoft Excel and analysed using STATISTICA 7 (StatSoft Inc., Tulsa, USA). The analysis of answers involved descriptive quantitative statistics, such as frequen-

cies and percentages. Student's t-test for proportions and Mann-Whitney U-test were used to test for significant associations between demographic characteristics and non-prescription use of antibiotics for categorical variables ( $p < 0.05$ ).

## **Results**

### *Study population*

Characteristics of the study population are given in Table 1. It includes demographic data from all 402 respondents. Over 65% of the respondents were female, and three quarters were younger than 46 years. Most participants belonged to the Macedonian majority ethnic group (91%). Over 92% of respondents were covered by the universal health insurance, while 10% reported having a bad financial situation. We obtained information on the last URTI episode in previous six months for 122 children aged 0–4 years.

Table 1

*Demographic characteristics of the study participants*

Characteristics	Number of study participants (percentage) n = 402
<b>Age (years)</b>	
18–25	150 (37.3%)
26–45	157 (39.1%)
46–63	72 (17.9%)
64+	23 (5.7%)
<b>Gender</b>	
Male	126 (31.3%)
Female	276 (68.7%)
<b>Ethnic group</b>	
Majority (Macedonians)	366 (91%)
Minority (Roma, Turkish, Vlachs etc)	36 (9%)
<b>Region</b>	
Eastern Region	227 (56.7%)
South-eastern Region	108 (26.9%)
Vardar Region	67 (16.7%)
<b>Residence</b>	
Urban	277 (68.9%)
Rural	125 (31.1%)
<b>Marital status</b>	
Single	137 (34%)
Married	237 (59%)
Other (divorced, widow)	28 (7%)
<b>Have children under 5 years of age</b>	
Yes	122 (30.3%)
No	280 (69.7%)

Completed educational level	
No education	11 (2.7%)
Primary school	41 (10.2%)
Secondary school	256 (63.7%)
University degree	94 (23.4%)
Employment status	
Unemployed	99 (24.6%)
Student	79 (19.7%)
Employed (full / part-time)	186 (46.3)
Retired	38 (9.4%)
Health insurance coverage	
Yes	370 (92%)
No	32 (8%)
Financial situation	
Bad	43 (10.7%)
Good	359 (89.3%)

*Patient knowledge and beliefs about antibiotic use for URTI*

As illustrated in Figure 1, more than 60% (250/402) of participants knew that antibiotics were effective against bacteria, but only one quarter (96/402) understood that they were not effective against viruses. Less than one tenth (38/402) of participants knew that antibiotics did not work on most coughs and colds. Half

(214/402) of the respondents were aware of antibiotic resistance. Only 21 participants (5.2%) answered correctly all four statements on antibiotic knowledge. Eighty-nine participants (22.1%) did not answer any of the questions correctly. The mean number of correct responses to all four statements was 1.49 (37.3%). About 83% (334/402) of respondents had not heard of EAAD.

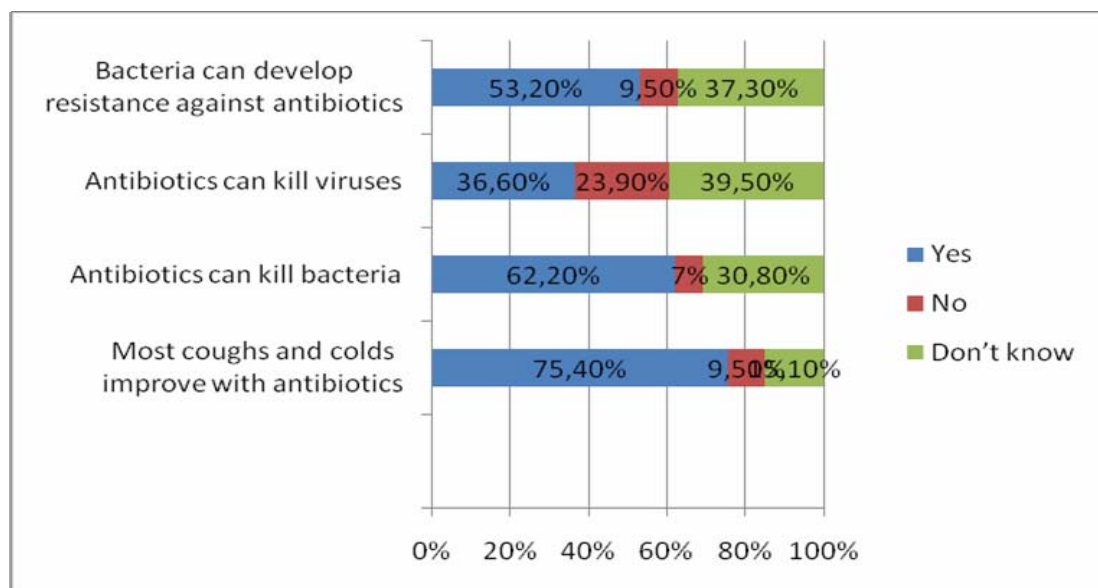


Figure 1 – Public knowledge on antibiotics

When asked which URTI symptoms they believed get better more quickly with antibiotics, only 3.2% (13/402) of participants did not mention any URTI symptom. Figure 2

shows that the three most frequently mentioned URTI symptoms were: influenza (186/402), sore throat without temperature (174/402) and cold (147/402).

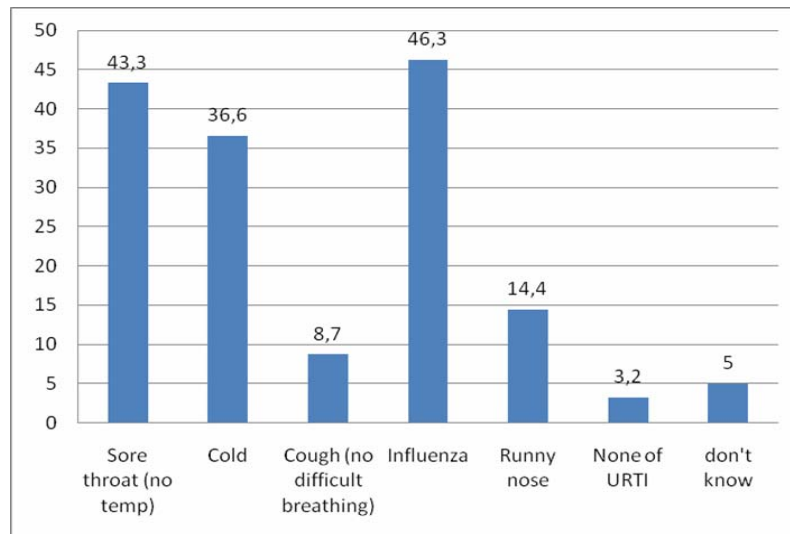


Figure 2 –Public expectations on URTI symptoms that improve faster with antibiotics (%)

#### *Non-prescription use of antibiotics*

In the last year, 68.4% (275/402) of the participants were prescribed an antibiotic by their medical doctors. For the same period, 72.1% (287/402) said they stored oral antibiotics at home, and 43.3% (174/402) purchased oral antibiotics without prescription.

About 90% of the respondents (365/402) suffered an URTI episode in the six months preceding the study. On average, each affected respondent suffered 2 URTI episodes (728/365) during that period. As illustrated in Table 2, the commonest URTI symptoms suffered by study respondents in the last six months were colds and coughs, runny nose and sore throat.

Table 2

*URTI symptoms suffered by the respondents in the last six months (%)*

URTI symptoms suffered in last six months	Number of study participants (percentage) n = 402
Sore throat (no temperature)	127 (31.6%)
Cold	181 (45%)
Cough (no difficult breathing)	165 (41%)
Influenza	88 (21.9%)
runny nose	167 (41.5%)
none	37 (9.2%)

Figure 3 presents which measures the respondents took to treat their last URTI episode,

suffered in the previous six months. About half of them (180/365) only consumed analgesics or antipiretics, drank tea or rested. Approximately a third of the respondents (120/365) consulted their medical doctor. Oral antibiotics stored at home were taken by 11.8% (43/365) of the participants with URTI symptoms. Another 6% (22/365) purchased oral antibiotics without prescription and treated the URTI episode. In all, 17.8% of the respondents self-medicated themselves with non-prescribed oral antibiotics (either stored at home or purchased OTC) following an URTI episode in the last six months.

There was no significant association between OTC purchase of antibiotics in the last year and any of the participants' demographic characteristics, such as: age, gender, education, employment status, residence, marital status, insurance, financial situation ( $p > 0.05$ ), as illustrated in Table 3.

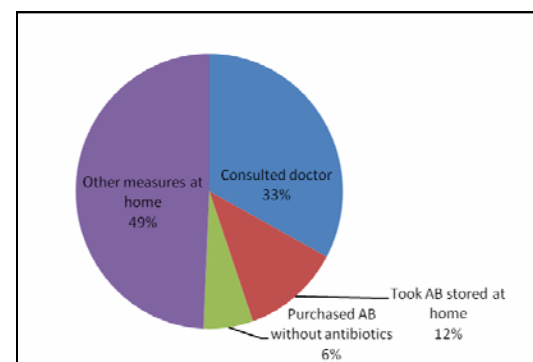


Figure 3 – Measures taken to treat the last URTI episode in previous six months

Table 3

*Association between participants' demographic characteristics and OTC purchase of antibiotics*

Participants' characteristics	n° participants (%) total = 402	OTC purchase of antibiotics (%) answer YES = 174	p-value
<b>Age (years)</b>			
18–25	150 (37.3%)	66 (38%)	0.8735
26–45	157 (39.1%)	71 (40.8%)	0.7018
46–63	72 (17.9%)	28 (16.1%)	0.6007
64+	23 (5.7%)	9 (5.1%)	0.7723
<b>Gender</b>			
Male	126 (31.3%)	56 (32.2%)	0.8127
Female	276 (68.7%)	118 (67.8%)	0.8127
<b>Residence</b>			
Urban	277 (68.9%)	110 (63.2%)	0.1815
Rural	125 (31.1%)	64 (36.8%)	0.1815
<b>Marital status</b>			
Single	137 (34%)	67 (38.5%)	0.3001
Married	237 (59%)	97 (55.7%)	0.4615
Other	28 (7%)	10 (5.8%)	0.5955
<b>Education</b>			
No education	11 (2.7%)	4 (2.3%)	0.7811
Primary school	41 (10.2%)	21 (12.1%)	0.4998
Secondary school	256 (63.7%)	112 (64.4%)	0.8724
University degree	94 (23.4%)	37 (21.2%)	0.5632
<b>Employment status</b>			
Unemployed	99 (24.6%)	39 (22.4%)	0.5701
Student	79 (19.7%)	37 (21.3%)	0.6606
Employed	186 (46.3)	79 (45.4%)	0.8423
Retired	38 (9.4%)	19 (10.9%)	0.5794
<b>Health insurance coverage</b>			
Yes	370 (92%)	162 (93.1%)	0.6795
No	32 (8%)	12 (6.9%)	0.6795
<b>Financial situation</b>			
Bad	43 (10.7%)	17 (9.8%)	0.7457
Good	359 (89.3%)	157 (90.2%)	0.7457

Table 4 also shows no significant association between antibiotics stored at home in the last year and participants' demographic characteristics ( $p > 0.05$ ).

Table 4

*Association between participants' demographic characteristics and antibiotics kept at home*

Participants' characteristics	n° participants (%) total =402	Antibiotics kept at home (%) answer YES = 287	p-value
<b>Age (years)</b>			
18–25	150 (37.3%)	108 (37.6%)	0.9361
26–45	157 (39.1%)	109 (38%)	0.7905
46–63	72 (17.9%)	52 (18.1%)	0.9732
64+	23 (5.7%)	18 (6.3%)	0.7428
<b>Gender</b>			
Male	126 (31.3%)	91 (31.7%)	0.9113
Female	276 (68.7%)	196 (68.3%)	0.9113
<b>Residence</b>			
Urban	277 (68.9%)	197 (68.6%)	0.9333
Rural	125 (31.1%)	90 (31.4%)	0.9333

Marital status			
Single	137 (34%)	103 (35.9%)	0.6059
Married	237 (59%)	162 (56.4%)	0.4958
Other	28 (7%)	22 (7.7%)	0.7277
Education			
No education	11 (2.7%)	6 (2%)	0.5548
Primary school	41 (10.2%)	28 (9.8%)	0.8633
Secondary school	256 (63.7%)	187 (65.2%)	0.6855
University degree	94 (23.4%)	66 (23%)	0.9025
Employment status			
Unemployed	99 (24.6%)	68 (23.7%)	0.7858
Student	79 (19.7%)	61 (21.3%)	0.6073
Employed	186 (46.3)	130 (45.3%)	0.7952
Retired	38 (9.4%)	28 (9.7%)	0.8948
Health insurance coverage			
Yes	370 (92%)	269 (93.7%)	0.3978
No	32 (8%)	18 (6.3%)	0.3978
Financial situation			
Bad	43 (10.7%)	30 (10.5%)	0.9331
Good	359 (89.3%)	257 (89.5%)	0.9331

As for the recent URTI episode, Table 5 shows no significant association between participants' actual self-medication with antibiotics purchased OTC and their demography ( $p > 0.05$ ).

Table 5

*Association between participants' demographic characteristics and self medication with OTC purchased antibiotics during recent URTI episode*

Participants' characteristics	n° participants (%) total=402	Self-medication with OTC AB (%) answer YES = 22	<i>p-value</i>
Age (years)			
18–25	150 (37.3%)	8 (36.4%)	0.9548
26–45	157 (39.1%)	10 (45.5%)	0.5437
46–63	72 (17.9%)	3 (13.6%)	0.5994
64+	23 (5.7%)	1 (4.5%)	0.8123
Gende			
Male	126 (31.3%)	5 (22.7%)	0.3956
Female	276 (68.7%)	17 (77.3%)	0.3956
Residenc			
Urban	277 (68.9%)	16 (72.77%)	0.7074
Rural	125 (31.1%)	6 (27.37%)	0.7074
Marital status			
Single	137 (34%)	7 (31.8%)	0.8471
Married	237 (59%)	14 (63.6%)	0.6692
Other	28 (7%)	1 (4.5%)	0.6519
Educationr			
No education	11 (2.7%)	1 (4.5%)	0.6181
Primary school	41 (10.2%)	1 (4.5%)	0.3840
Secondary school	256 (63.7%)	14 (63.6%)	0.9924
University degree	94 (23.4%)	6 (27.4%)	0.9501
Employment status			
Unemployed	99 (24.6%)	6 (27.3%)	0.7996
Student	79 (19.7%)	4 (18.2%)	0.8631
Employed	186 (46.3)	10 (45.5%)	0.9416
Retired	38 (9.4%)	2 (9%)	0.9501

Health insurance coverage			
Yes	370 (92%)	20 (90.9%)	0.8669
No	32 (8%)	2 (9.1%)	0.8669
Financial situation			
Bad	43 (10.7%)	4 (18.2%)	0.3143
Good	359 (89.3%)	18 (81.8%)	0.3143

Significant association was not found for recent URTI episode self-medication with antibiotics stored at home and any of the parti-

cipants' demographic characteristics, as demonstrated in Table 6 ( $p > 0.05$ ).

Table 6

*Association between participants' demographic characteristics and self-medication with antibiotics kept at home during recent URTI episode*

Participants' characteristics	n° participants (%) total = 402	Self-medication with AB kept at home (%) answer YES = 43	<i>p-value</i>
Age (years)			
18–25	150 (37.3%)	16 (37.1%)	0.9794
26–45	157 (39.1%)	15 (34.9%)	0.5999
46–63	72 (17.9%)	10 (23.3%)	0.4225
64+	23 (5.7%)	2 (4.7%)	0.7865
Gender			
Male	126 (31.3%)	14 (32.6%)	0.8296
Female	276 (68.7%)	29 (67.4%)	0.8296
Residence			
Urban	277 (68.9%)	29 (67.4%)	0.8402
Rural	125 (31.1%)	14 (32.6%)	0.8402
Marital status			
Single	137 (34%)	14 (32.6%)	0.8538
Married	237 (59%)	26 (60.4%)	0.8595
Other	28 (7%)	3 (7%)	1.0
Educationr			
No education	11 (2.7%)	2 (4.7%)	0.4787
Primary school	41 (10.2%)	4 (9.3%)	0.8255
Secondary school	256 (63.7%)	30 (69.8%)	0.4279
University degree	94 (23.4%)	7 (16.2%)	0.2847
Employment status			
Unemployed	99 (24.6%)	15 (34.9%)	0.1420
Student	79 (19.7%)	7 (16.3%)	0.5921
Employed	186 (46.3)	17 (39.5%)	0.3953
Retired	38 (9.4%)	4 (9.3%)	0.9893
Health insurance coverage			
Yes	370 (92%)	40 (93%)	0.8174
No	32 (8%)	3 (7%)	0.8174
Financial situation			
Bad	43 (10.7%)	7 (16.3%)	0.3289
Good	359 (89.3%)	36 (83.7%)	0.3289

About 30% of the respondents (122/402) had children under five years old, and most of them (113/122) suffered an URTI episode in

the last six months. A large majority of children (87.6%) were taken to paediatricians, while 10.6% (10/122) were given analgesics,



antipyretics, tea or rested. Two children (1.8%) were given antibiotics stored at home by their parents, and no children were treated with antibiotics purchased without prescription.

### Discussion

Our study demonstrated a relatively low level of public knowledge about antibiotics and URTI. In particular, 24% of our respondents knew that antibiotics cannot kill viruses. According to the 2009 Eurobarometer study [27], this is comparable to public knowledge on antibiotics in eastern and southern Europe (Portugal and Romania: 14%, Lithuania: 20%, Cyprus: 21%, Bulgaria: 22%). But it is lower than the EU average (36%) and northern EU countries results (Great Britain: 50%, Netherlands: 52%, Sweden: 73%). Even worse, only 9.5% of our respondents knew that antibiotics were not effective against colds and influenza, which is lower than the EU average (47%), or any EU country results (Finland: 72%, Netherlands: 66%, Slovenia: 63%, Greece and Bulgaria: 28%, Portugal: 18%).

Similarly, a large proportion of the respondents in Macedonia believed that taking an antibiotic would lead to a quicker recovery from influenza (46.3%), sore throat without temperature (43.3%) and cold (36.6%). This is in contrast to the observed low prevalence of respondents expecting antibiotics for most URTI in Germany (10.5%) and the UK (4–17%), except for influenza (Germany: 46.9%, UK: 32%). This increased global expectation for antibiotic treatment in influenza is linked to the recent H1N1 pandemic influenza and the lack of public understanding of the difference between antiviral agents and antibiotics [28, 29].

The incorrect knowledge on antibiotics and URTI complements the findings that just 17% of respondents in Macedonia had heard of the EAAD, which is the only national public education activity aiming to improve antibiotic use. The public's unfamiliarity with the EAAD suggests the campaign was probably distant from the lay public audience, acting in isolation. Furthermore, such mass-media activities are costly, so they are consequently organised only seasonally for short periods during the influenza season [30]. It is therefore essential to accompany future public campaigns in Macedonia with health professionals' active engagement in public education.

Medical doctors, and especially community pharmacists, have legitimacy and are best placed to convey the messages on appropriate antibiotic use to their patients. Community pharmacists are often the first point of contact for the public when presenting with symptoms, so they are central in advising patients on minor ailments or referring them to their doctors. This gives pharmacists an important role in demystifying the need to use antibiotics to treat colds, coughs, influenza etc [31]. Such a multifaceted strategy might help bring the EAAD campaign closer to the lay audience and have a lasting impact on public antibiotic awareness and practices in Macedonia.

The study found that 43.3% of respondents purchased antibiotics without prescriptions last year, despite the national regulation that restricts antibiotics as prescription-only medicines. The same happens in other eastern and southern European countries [12] and many developing countries [13] with poor enforcement of drug regulations. Furthermore, 71.4% of the participants stored antibiotics at home in the last year. The corresponding figures of home stored antibiotics were lower in Israel (25%) [32] and in the EU countries (from 3% in the Netherlands up to 57% in Italy) [12], but higher in Jordan (73.1%) [33] and Russia (84%) [34]. The habit of storing antibiotics at home probably originates from the earlier period of transition in Macedonia when medicines were scarcely available, and people used to pile up reserves for future needs [35]. We assume that antibiotics stored at home comprised of OTC purchased antibiotics and/or antibiotics left from incomplete courses of antibiotics, prescribed by doctors. The issue of possible patient non-compliance needs further attention, as it may result in two inappropriate courses if patients do not take the amount of antibiotics prescribed by doctors and later on self-medicate themselves with the leftovers [12].

In total, 17.8% of cases reported self-medication with antibiotics for URTI symptoms in the last six months. We are in the same group with other eastern and southern EU countries with the highest self-medication rates in Europe, even though their indications were not necessarily URTI (Spain: 15.2%, Romania: 19.8%, Lithuania: 21%) [27]. On the other hand, only 1.8% of the children with URTI were given antibiotics without medical consultation in the last six

months. It is encouraging that the majority of children with URTU were taken to paediatricians for advice, confirming the existence of a comprehensive and accessible network of child primary healthcare services in the country [36].

The discrepancy of 25% between antibiotics purchased without prescriptions in the last year and the actual self-medication for the recent URTI episodes probably suggests that some OTC antibiotics were either stored without being consumed or were used for indications other than URTI. Previous EU studies have reported eye infections, toothache or gym symptoms, pain, urinary tract infections, headache, skin infection, or gastrointestinal problems as the most common reasons for self-medication with antibiotics, in addition to URTI [12]. Therefore, further research should address all intended indications for OTC purchased antibiotics and self-medication practices in Macedonia. In addition, we need to establish pharmacy-based medicines waste collection services, so that community pharmacists can collect the leftover antibiotics, reducing their availability at home and the possibility of self-medication in the future [31].

This community-based survey in Macedonia, with its large sample size and diverse participants, allow us to gain valuable insight into public knowledge on antibiotics and URTI as well as self-medication practices. However, our study has its own limitations, such as: the restricted geographical coverage and the over-representation of younger age groups, women and a Macedonian majority compared with the country's general population [37]. Therefore, future studies should aim for better demographic representation of the participants. Moreover, prescribing and dispensing practices should be studied in parallel in order to gain a more comprehensive picture of antibiotic use in Macedonia.

Another limitation of the survey is that the results are based on self-reported data, which have the potential for recall bias, under-reporting and over-reporting. To minimize these possibilities, we limited the recall period to the previous 6 to 12 months, and formulated the questions on self-medication in a neutral way, providing the "don't know" answers. In the future, the research is expected to combine different methods that validate self-reported data (observational studies, mystery client surveys, visual checks of antibi-

otics kept at home or purchased at pharmacies). Despite its potential limitations, this study provides important baseline data on public knowledge and behaviour regarding antibiotics and URTI in the Republic of Macedonia.

## Conclusions

Our study reveals that public knowledge on antibiotics, self-medication practices, and the availability of OTC antibiotics present causes for concern in the Republic of Macedonia. Neglecting or ignoring these problems and failing to take appropriate measures contributes to the spread of antimicrobial resistance, so urgent action is required at several levels. The comprehensive set of measures should be started with the reinforcement of the existing legal regulations that restrict access to prescription-only antibiotics. Second, prescribed and non-prescribed antibiotic use should be monitored and accompanied by surveillance programmes on antibiotic resistance. Finally, multifaceted interventions aiming to reduce public misconceptions about antibiotic use for minor ailments should combine large scale public campaigns with pharmacists and medical doctors' health education activities at primary healthcare level.

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## Резиме

### АНТИБИОТСКА ТЕРАПИЈА ЗА ИНФЕКЦИИ НА ГОРНИТЕ ДИШНИ ПАТИШТА: ПОЗНАВАЊА, ОЧЕКУВАЊА И САМОМЕДИКАЦИЈА КАЈ ОПШТАТА ПОПУЛАЦИЈА ВО РЕПУБЛИКА МАКЕДОНИЈА

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Самомедикацијата како дел од нерационалната употреба на антибиотици придонесува за ширењето на антимикробната резистенција. Целта на ова истражување врз општата популација во Република Македонија е да се утврдат нивните познавања, очекувања и самомедикацијата со антибиотици при инфекции на горните дишни патишта. Во април 2012 година спроведена е напречна студија во три статистички региони во Македонија. Анонимниот прашалник е одговорен од 402 испитаника. Анализата на резултатите опфаќа дескриптивна квантитативна статистика (фреквенции и проценти). Ја испитавме и значителната поврзаност меѓу демографските карактеристики и употребата на антибиотици без рецепт. Во споредба со земјите од ЕУ, нашите испитаници покажаа релативно слабо познавање за антибиотиците и третманот на инфекциите на горните дишни патишта. Студијата покажа дека во последната година 71,4% од учесниците чувале дома антибиотик, а 43,3% купиле антибиотик без рецепт во последната година и покрај законската регулатива која го ограничува издавањето на антибиотик само со рецепт. Самомедикација со антибиотици при последната инфекција на горните дишни патишта била применета кај 17,8% од возрасните испитаници и кај 1,8% од децата на возраст 0–4 години. Не е утврдена значителната поврзаност меѓу некоја од демографските карактеристики и употребата на антибиотици без рецепт. Нашите резултати не сместуваат во групата на источни и јужни земји од ЕУ со најголема употреба на антибиотици без рецепт во Европа. За превенција на самомедикацијата со антибиотици потребно е спроведување на мултикомпонентни интервенции кои вклучуваат: спроведување на регулативата за издавање антибиотици само со рецепт, следење на употребата на антибиотици и стапката на антимикробната резистенција и комбинирани стратегии за здравствена едукација за општата популација.

ведена е напречна студија во три статистички региони во Македонија. Анонимниот прашалник е одговорен од 402 испитаника. Анализата на резултатите опфаќа дескриптивна квантитативна статистика (фреквенции и проценти). Ја испитавме и значителната поврзаност меѓу демографските карактеристики и употребата на антибиотици без рецепт. Во споредба со земјите од ЕУ, нашите испитаници покажаа релативно слабо познавање за антибиотиците и третманот на инфекциите на горните дишни патишта. Студијата покажа дека во последната година 71,4% од учесниците чувале дома антибиотик, а 43,3% купиле антибиотик без рецепт во последната година и покрај законската регулатива која го ограничува издавањето на антибиотик само со рецепт. Самомедикација со антибиотици при последната инфекција на горните дишни патишта била применета кај 17,8% од возрасните испитаници и кај 1,8% од децата на возраст 0–4 години. Не е утврдена значителната поврзаност меѓу некоја од демографските карактеристики и употребата на антибиотици без рецепт. Нашите резултати не сместуваат во групата на источни и јужни земји од ЕУ со најголема употреба на антибиотици без рецепт во Европа. За превенција на самомедикацијата со антибиотици потребно е спроведување на мултикомпонентни интервенции кои вклучуваат: спроведување на регулативата за издавање антибиотици само со рецепт, следење на употребата на антибиотици и стапката на антимикробната резистенција и комбинирани стратегии за здравствена едукација за општата популација.

**Клучни зборови:** антибиотици, антимикробна резистенција, познавања, очекувања, инфекции на горните дишни патишта, Република Македонија.