ANTIBIOTIC RESISTANCE

PUBLIC AWARENESS SURVEY IN ALBANIA

INSTITUTE OF PUBLIC HEALTH

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EXECUTIVE SUMMARY

Currently, antibiotic resistance is one of the biggest threats to global health. Over-prescribing by health workers and the easiness of taking antibiotics in drugstores are a well-known phenomenon in many countries including Albania which, after the breakdown of the communist regime in 1990, has been undergoing a rapid transition associated with tremendous political, economic and social changes. To date, there is no national action plan for tackling antibiotic resistance in Albania.

In the framework of a national campaign about antibiotic resistance, a cross-sectional study was conducted in selected districts of Albania (Tirana, Vlora and Shkodra) in October 1-20, 2016. The aim of this survey was to assess the level of knowledge, attitude and practices of the Albanian adult population regarding the antibiotic resistance.

The study population consisted of adult (≥18 years) primary health care users residing in urban, suburban and rural areas of the districts included in the survey. Overall, the study sample included 1223 individuals (653 [53.3%] females and 570 [46.7%] males; overall mean age: 45.3±18.2 years; overall response rate: 94%).

The WHO questionnaire administered in the multi-country public awareness survey (published in 2015) was used. Participants were asked about the use of antibiotics (in the last month, last 6 months, last year, or more than a year ago), the way of obtaining antibiotics in drugstores (with or without a prescription), the level of knowledge about antibiotics, as well as the level of knowledge about and the understanding of the issue of antibiotic resistance.

The salient findings of this survey including a representative sample of adult primary health care users in Albania are summarized below:

Prevalence and socio-demographic correlates of antibiotic use:

- Overall, 31% of participants included in this survey reported use of antibiotics in the last month; further 30% reported use in the last 6 months; 19% in the last year; 12% more than a year ago, whereas 4% of individuals had never used antibiotics.
- The prevalence of *antibiotic use in the last month* was considerably higher in rural areas compared with urban areas (41% vs. 28%, respectively, P<0.001); in the low-educated individuals compared with the high-educated participants (38% vs. 23%, respectively, P<0.001); and in individuals who perceived themselves as poor compared with those who did not perceive themselves as poor (38% vs. 29%, respectively, P=0.009).
- The prevalence of *antibiotic use in the last 6 months* was the highest among the youngest (≤35 years) participants (72%) and the lowest among older (≥61 years) individuals (39%). Similar to the last month use, the prevalence of antibiotic use in the last 6 months was considerably higher in rural areas compared with urban areas (81% vs. 54%, respectively, P<0.001); in the low-educated individuals compared to those with a higher educational attainment (62% vs. 53%, respectively); and in individuals who perceived themselves as poor compared with their counterparts who did not perceive themselves as poor (66% vs. 60%, respectively, P=0.08).
- The prevalence of *antibiotic use in the last year* was the highest among older (≥61 years) individuals (87%) and the lowest among the middle-aged (36-60 years) participants

(76%). Furthermore, it was higher in rural areas compared with urban areas (90% vs. 76%, respectively, P<0.001); and in the low-educated participants compared with their highly educated counterparts (84% vs. 67%, respectively).

Obtaining antibiotics:

- Among participants who reported use of antibiotics, 71% of them reported that they obtained their antibiotics through a medical prescription (from their family physicians and/or specialists), whereas 24% did not get their antibiotics with a medical prescription. There were significant sex differences regarding the way antibiotics were obtained: 75% of females reported a medical prescription for obtaining antibiotics compared with 66% of males (P=0.006). In addition, there was a graded relationship with age: about 78% of the youngest respondents obtained antibiotics upon medical prescription compared to 72% and 60% of middle-aged and older individuals, respectively (P<0.001). Also, there was evidence of a linear association with educational attainment: about 55% of individuals with 0-8 years of formal schooling reported medical prescription for getting antibiotics, compared to 65% and 92% of those with 9-12 years and ≥13 years of education, respectively. Furthermore, the medical prescription level was higher in urban areas compared to suburban areas and especially rural areas.

Knowledge about antibiotics:

- Overall, 61% of participants answered (correctly) that the full course of antibiotics should be taken as directed. Conversely, about 33% reported that antibiotics may be stopped when they feel better. There was a positive association of proper knowledge about use of antibiotics (that is interruption of use only after taking all the antibiotics as directed) with older age, a higher educational attainment and urban residence.
- The majority of respondents (69%) correctly identified skin/wound infections as conditions which can be treated with antibiotics. However, only 61% of respondents correctly identified gonorrhoea as a condition which is treatable by antibiotics. On the other hand, there was a considerable share of participants who mistakenly considered that conditions which are usually viral, and therefore do not respond to antibiotics, can be treated with antibiotics. In particular, 73% of individuals erroneously considered that sore throats can be treated with antibiotics. Furthermore, 69% of participants stated that common colds and flu should be treated with antibiotics. Also, 41% and 34% of individuals deemed appropriate the use of antibiotics for general body aches and headaches, respectively. In general, younger participants, those with a lower educational attainment and respondents from suburban and rural areas had a lower level of knowledge about the conditions/diseases that should be treated with antibiotics.

Knowledge about antibiotic resistance:

- Overall, 67% of participants had heard about antibiotic resistance; 63% had heard about the term drug resistance; 59% had heard about antibiotic-resistant bacteria; and 46% had heard about antimicrobial resistance. Only 39% had heard about superbugs, whereas 21% of individuals included in this survey had not heard any of the aforementioned terms. Similar to the correct use of antibiotics, a significantly lower proportion of younger participants, those with a lower educational attainment and respondents from suburban and rural areas had heard about the abovementioned terms related to antibiotic resistance.

- Health professionals (doctors and nurses) constituted the most frequent source of information about antibiotic resistance (42%) followed by the media (39%) consisting of TV, radio or newspapers. These two sources were followed by family and/or friends (27%) and pharmacists (26%).

Understanding the issue of antibiotic resistance:

- Several statements related to a proper understanding of antibiotic resistance were correctly identified by the majority of study participants. Nevertheless, there were some other statements which were wrongly identified by survey respondents, indicating that there are high levels of misunderstanding about many aspects of antibiotic resistance among Albanian adults.

This is one of the very first reports informing about the level of knowledge, attitude and practices of the Albanian adult population regarding the antibiotic resistance. Yet, further studies should be conducted in Albania including nationwide population-representative samples of adults in order to confirm and replicate the findings of the current survey.

In conclusion, findings of this survey may help health professionals, policymakers and decision-makers in Albania to design appropriate and cost-effective strategies and interventions for the control and prevention of antibiotic resistance in the general population. From this point of view, findings of the current study can both help shape future public awareness efforts and aid evaluation of the impact of these efforts in the context of Albania. Nonetheless, a rigorous response to the issue of antibiotic resistance requires strong leadership, advocacy, and resources. Hence, the Albanian government must play a central role in providing stewardship and coordination in this process.

BACKGROUND

Antimicrobial resistance as a global challenge

Antimicrobial resistance (AMR) is conventionally defined as *"resistance of a microorganism to an antimicrobial medicine to which it was originally sensitive"*. Resistant organisms – including bacteria, fungi, viruses and some parasites – are able to endure attack by antimicrobial medicines, such as antibiotics, antifungals, antivirals, and antimalarials, so that standard treatments become ineffective and infections persist increasing risk of spread to others.

Antibiotic resistance is one type of antimicrobial resistance where bacteria develop the ability to resist the effects of an antibiotic to which they were once sensitive.

Currently, antibiotic resistance is one of the biggest threats to global health. Over-prescribing by health workers and the easiness of taking antibiotics in drugstores are a well-known phenomenon in many countries.

Antimicrobial resistance in Albania

After the breakdown of the communist regime in 1990, Albania has been undergoing a rapid transition associated with tremendous political, economic and social changes. Over the last several years, the greatest burden of disease in Albania has been attributed to non-communicable diseases (NCDs), with circulatory system diseases, cancer, accidents and injuries accounting for the highest causes of mortality. Nonetheless, Albania continues to face different challenges related to a number of vaccine-preventable diseases, such as viral hepatitis and mumps. In addition, the incidence of epizootic diseases is increasing in the country, mainly due to deficient veterinary control of domestic animals[1]. The incidence rate of tuberculosis in Albania (16/100,000) is low in comparison with the neighboring countries including Kosovo (47/100,000), Montenegro (18/100,000) and Serbia (23/100,000), as well as the WHO European Region average (40/100,000)[2]. With regard to the Millennium Development Goal (MDG) of eliminating tuberculosis (Target 6.2), the mortality rate in 2008 was also low, at 3.5 per 100,000 (UNDP, 2010)[3]. However, the proportion of TB cases detected (50.6%) and cured (89.4%) under Directly Observed Treatment Short-course (DOTS) is low, due to the difficulty for the health system in dealing adequately with the complex DOTS procedure, particularly in rural and remote areas.

A major concern in Albania is the absence of a sustainable network of national antimicrobial surveillance systems in order to collect valid, representative, and comparable data on antimicrobial use. Although emphasis on the misuse of antimicrobials, especially antibiotics, and an increased sensibility on the antibacterial resistance have been reported in the grey literature, there is no national data available on neither drug consumption in general nor antibiotic consumption in particular. As a matter of fact, there is no national action plan for tackling antibiotic resistance in Albania.

In the framework of a national campaign about antibiotic resistance, a cross-sectional study was conducted in selected districts of Albania in October 2016.

[1] WHO Regional Office for Europe. Aide memoire AMR mission to Albania. Tirana: November 24-27, 2014.
[2] WHO. Global tuberculosis report 2013. Geneva, World Health Organization; 2013.
[3] UNDP. Albania national report on progress towards achieving the Millennium Development Goals. Tirana, United Nations in Albania; 2010.

Aim and specific objectives of the current survey conducted in Albania

The aim of this cross-sectional study was to assess the level of knowledge, attitude and practices of the Albanian adult population regarding the antibiotic resistance.

In particular, specific objectives of this survey were the following:

Use of antibiotics:

- To assess the prevalence of antibiotic use in the Albanian adult population:
  - Use of antibiotics in the last month
  - Use of antibiotics in the last 6 months
  - Use of antibiotics in the last year
  - Use of antibiotics more than a year ago
  - No lifetime use of antibiotics
- To determine the ways of obtaining antibiotics:
  - With doctor's prescription
  - Without prescription
- To assess the distribution of antibiotic use (in the last month, last 6 months, and last year) by selected factors:
  - Demographic factors (sex, age-group, district, place of residence and marital status)
  - Socioeconomic characteristics (educational attainment, self-perceived poverty)
- To assess the independent predictors (determinants) of antibiotic use (in the last month, last 6 months, and last year) in the adult population

Knowledge about antibiotics:

- To assess the level of knowledge about conditions/diseases that antibiotics should be used to treat
- To assess the level of knowledge about the correct interruption of antibiotics once treatment has started
- To assess the association between the level of knowledge about antibiotics and demographic factors and socioeconomic characteristics

Knowledge about and understanding of the issue of antibiotic resistance:

- To assess the level of acquaintance (familiarization) with the main terms related to antibiotic resistance
- To determine the main sources of information related to antibiotic resistance at a population level
- To assess the association between the level of knowledge about and understanding of antibiotic resistance and demographic factors and socioeconomic characteristics of the adult population of Albania

METHODOLOGY

Study design

A cross-sectional study was conducted in selected districts of Albania in 2016, in the framework of a national campaign aiming at raising the awareness of the general population with regard to the antibiotic resistance.

Setting and timeline

The survey was conducted during the period 1-20 October 2016 and included the following three districts of Albania: Tirana (the capital), Shkodra (main district in the north) and Vlora (main districts in the south).

Study population and sampling

The study population consisted of primary health care users in different health centers (from urban, suburban and rural areas) in Tirana, Vlora and Shkodra.

Overall, 1300 individuals were invited to participate in this survey. Inclusion criteria consisted of adult individuals (≥18 years) who agreed to participate and were able to respond to the questionnaire adopted for this study.

Calculations of the sample size were done by use of WINPEPI[4] for different hypotheses related to the prevalence of antibiotic use and the level of knowledge about the issue of antibiotic resistance. The significance level (two-tailed) was set at 5%, and the power of the study at 80%. Based on several (conservative) scenarios, the minimal required sample size was estimated at 740 individuals.

Nevertheless, we decided to invite 1300 individuals in order to increase the power of the study accounting for potential non-response and especially for the heterogeneity of the study sample (pertinent to three different districts of Albania).

Of the targeted sample (N=1300), 77 individuals (5.9% of the targeted sample) were unable to respond and/or refused to participate. The final study sample included 1123 individuals (653 [53.3%] females and 570 [46.7%] males; overall mean age: 45.3±18.2 years; overall response rate: 1223/1300=94.1%).

Data collection

The WHO questionnaire administered in the multi-country public awareness survey[5] was used after being slightly adapted in the Albanian context. The questionnaire was translated (from English into Albanian) and subsequently back-translated (from Albanian into English) by experts following the standard methods of translation and cross-cultural adaptation of the

[4] Abramson JH. WINPEPI updated: computer programs for epidemiologists, and their teaching potential. Epidemiologic Perspectives & Innovations 2011;8:1.

[5] WHO. Antibiotic resistance: Multi-country public awareness survey. Geneva, Switzerland; 2015. ISBN: 9789241509817.

questionnaires[6]. Next, it was pretested in a small (convenient) sample of adult primary health care users in Tirana, in line with the scientific principles and research methods employed in similar surveys conducted elsewhere[7].

More specifically, participants were asked about the use of antibiotics (in the last month, last 6 months, last year, or more than a year ago), the way of obtaining antibiotics in drugstores (with or without a prescription), the level of knowledge about antibiotics, as well as the level of knowledge about and the understanding of the issue of antibiotic resistance.

The full version of the WHO questionnaire administered in the multi-country public awareness survey is available at:
http://apps.who.int/iris/bitstream/10665/194460/1/9789241509817_eng.pdf?ua=1.

Data analysis

Chi-square test was used to compare the distribution of (categorical) demographic factors and socioeconomic characteristics between study groups distinguished by the use of antibiotics.

On the other hand, student's t-test was used to compare the mean age of male vs. female participants and individuals pertinent to different districts included in the survey.

Conversely, binary logistic regression was used to assess the predictors (determinants) of antibiotic use (in the last month, in the last 6 months, and in the last year) in the study sample. Multivariable-adjusted odds ratios (ORs) were calculated and reported along with their respective 95% confidence intervals (95%CIs) and the p-values.

The following variables were entered simultaneously into the multivariate logistic regression models: sex of participants (males vs. females), age-group (≤35 years, 36-60 years and ≥61 years), district (Tirana, Shkodra and Vlora), place of residence (urban, suburban and rural areas), educational level (0-8 years, 9-12 years and ≥13 years of formal schooling), self-perceived poverty level (no vs. yes) and marital status (dichotomized in the analysis into: married vs. single/divorced/widowed).

In all cases and for all the tests employed, associations were regarded as statistically significant if the p-values were 5% or less.

Hosmer-Lemeshow test[8] was used to assess the goodness of fit of all the logistic regression models; all models met the criterion.

Statistical Package for Social Sciences, version 15.0, Chicago, Illinois was used for all the statistical analyses.

[6] Sperber AD, Devellis FR, Boehlecke B. Cross-cultural translation: methodology and validation. J Cross Cult Psychol 1994;25:501-24.

[7] Jovic-Vranes A, Bjegovic-Mikanovic V, Marinkovic J. Functional health literacy among primary health-care patients: data from the Belgrade pilot study. J Public Health 2009;31:490-5.

[8] Hosmer D, Lemeshow S. Applied logistic regression. New York: Wiley & Sons; 1989.

RESULTS

Description of the study population

Overall mean age of the study population was 45.3±18.2 years. Median (interquartile range) was 47.0 years (28.0-61.0 years). The age range was 72 years (from 18 years to 90 years). Mean was higher in males than in females (48.4±18.0 years vs. 42.6±17.4 years, respectively; independent samples t-test: P<0.001).

On the other hand, there was no statistically significant difference in the mean age among participants from the three districts included in the survey, regardless of a higher mean age of participants from Shkodra (47.2±19.8 years).

Participants from urban areas were a bit older than their counterparts from rural areas (45.7±18.8 years vs. 42.3±16.9 years, respectively, P<0.001).

Conversely, participants from suburban areas of Tirana exhibited the highest mean age in this survey (49.4±15.9 years).

Prevalence of antibiotic use

The prevalence of antibiotic use in this study population is presented in Table 1. Overall, 31% of participants reported use of antibiotics in the last month; further 30% reported use in the last 6 months; 19% in the last year; 12% more than a year ago, whereas 4% of individuals had never used antibiotics. Conversely, the remaining 4% of participants could not remember their respective frequency of antibiotic use.

Table 1. Distribution of antibiotic use in the overall study population

Antibiotic use	Frequency	Percent	Cumulative Percent
Last month	379	31.0	31.0
Last 6 months	368	30.1	61.1
Last year	230	18.8	79.9
More than a year ago	150	12.3	92.2
Never	49	4.0	96.2
Can’t remember	47	3.8	100.0
Total	***1223***	***100.0***	

Figure 1 presents the prevalence of antibiotic use by sex of study participants. The prevalence of antibiotic use in the last month was slightly higher in males than in females (32% vs. 30%, respectively), whereas an opposite finding was evident for the use of antibiotics in the last 6 months (32% in females vs. 28% in males). Furthermore, about 4% of both sexes had never used antibiotics during their lifetime.

Figure 1. Distribution of antibiotic use by sex of study participants

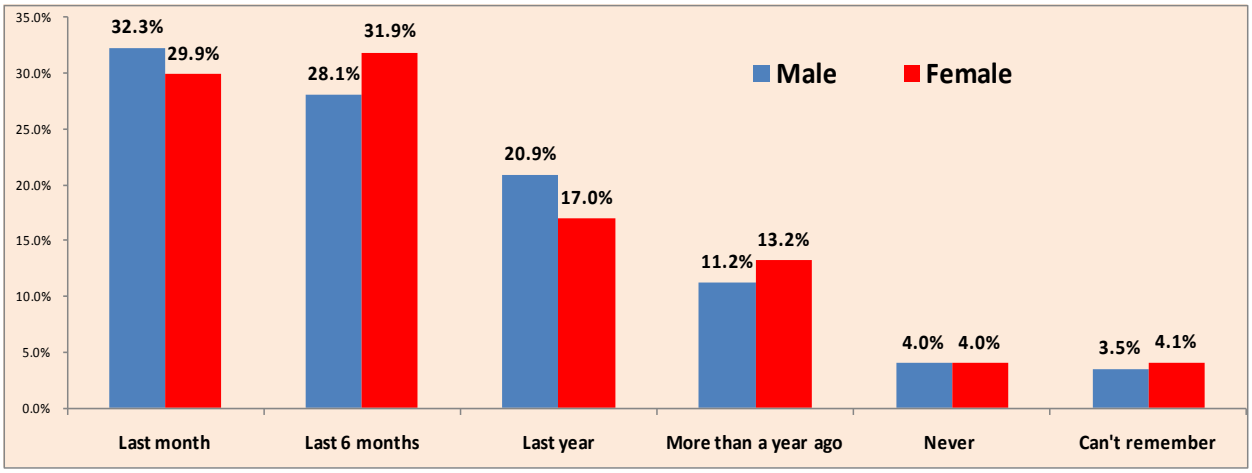
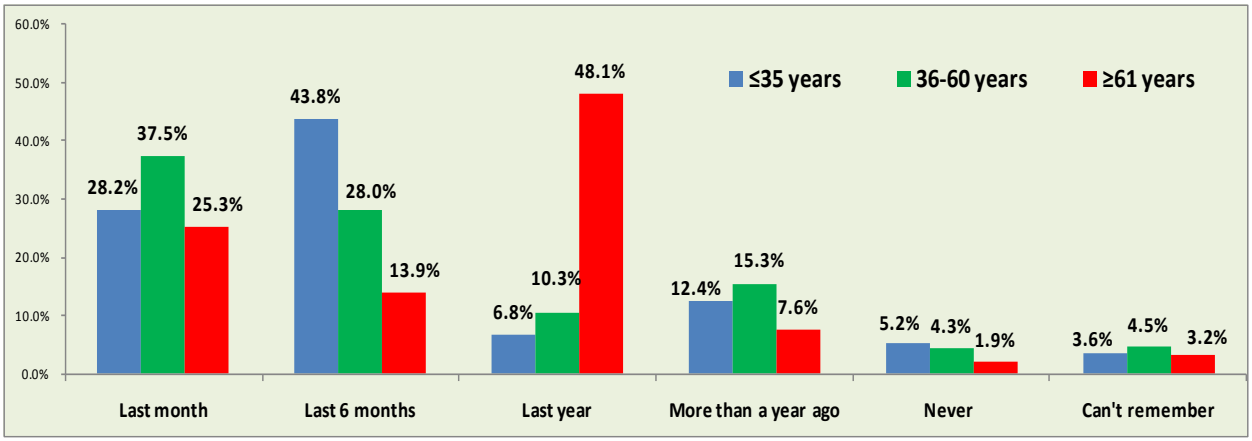


Figure 2 presents the prevalence of antibiotic use by age-group of study participants. The prevalence of antibiotic use in the last month was slightly higher in males than in females, whereas an opposite finding was evident for the use of antibiotics in the last 6 months (32% in females vs. 28% in males). Furthermore, about 4% of both sexes had never used antibiotics during their lifetime.

Figure 2. Distribution of antibiotic use by age - group of study participants



Antibiotic use in the last month

Table 2 presents the distribution of demographic characteristics and socioeconomic factors in the study sample by use of antibiotics in the last month. The prevalence of antibiotic use in the last month was slightly higher in males than in females (32% vs. 30%, respectively), but this difference was not statistically significant (P=0.39).

Table 2. Distribution of demographic and socioeconomic characteristics by use of antibiotics in the last month

Variable	Total (N=1223)	Use of antibiotics in the last month		
		No (N=844)	Yes (N=379)	P†
Sex:				
Male	570 (100.0)*	386 (67.7)	184 (32.3)	0.386
Female	653 (100.0)	458 (70.1)	195 (29.9)	
Age-group:				
≤35 years	443 (100.0)	318 (71.8)	125 (28.2)	<0.001
36-60 years	464 (100.0)	290 (62.5)	174 (37.5)	
≥61 years	316 (100.0)	236 (74.7)	80 (25.3)	
District:				
Tirana	604 (100.0)	442 (73.2)	162 (26.8)	<0.001
Shkodra	312 (100.0)	186 (59.6)	126 (40.4)	
Vlora	307 (100.0)	216 (70.4)	91 (29.6)	
Place of residence:				
Urban areas	840 (100.0)	607 (72.3)	233 (27.7)	<0.001
Suburban areas	111 (100.0)	77 (69.4)	34 (30.6)	
Rural areas	272 (100.0)	160 (58.8)	112 (41.2)	
Educational level:				
Low (0-8 years)	226 (100.0)	141 (62.4)	85 (37.6)	<0.001
Middle (9-12 years)	638 (100.0)	428 (67.1)	210 (32.9)	
High (≥13 years)	359 (100.0)	275 (76.6)	84 (23.4)	
Poverty:				
No	976 (100.0)	691 (70.8)	285 (29.2)	0.009
Yes	247 (100.0)	153 (61.9)	94 (38.1)	
Marital status:				
Other	435 (100.0)	334 (76.8)	101 (23.2)	<0.001
Married	788 (100.0)	510 (64.7)	278 (35.3)	

* Absolute numbers and their respective *row* percentages (in parentheses).

† P-values from chi-square test.

The prevalence of antibiotic use in the last month was the highest among middle-aged (36-60 years) individuals (38%) and the lowest among the youngest (≤35 years) participants (28%). The prevalence was the highest in Shkodra (40%), whereas in Tirana it was the lowest (27%). Overall, the prevalence of antibiotic use in the last month was considerably higher in rural areas compared with urban areas (41% vs. 28%, respectively, P<0.001). Furthermore, there was evidence of a graded relationship with educational attainment: the prevalence of antibiotic use in the last month was the highest in the low-educated individuals and the lowest among high-educated participants (38% vs. 23%, respectively, P<0.001). Individuals who perceived themselves as poor reported a significantly higher frequency of antibiotic use in the last month compared with their counterparts who did not perceive themselves as poor (38% vs. 29%, respectively, P=0.009). Finally, married participants had a higher prevalence of antibiotic use in the last month compared with those who were single, divorced, or widowed (35% vs. 23%, respectively, P<0.001).

Antibiotic use in the last 6 months

Table 3 presents the distribution of demographic characteristics and socioeconomic factors in the study sample by use of antibiotics in the last 6 months.

Table 3. Distribution of demographic and socioeconomic characteristics by use of antibiotics in the last 6 months

Variable	Total (N=1223)	Use of antibiotics in the last 6 months		
		No (N=476)	Yes (N=747)	P†
Sex:				
Male	570 (100.0)*	226 (39.6)	344 (60.4)	0.334
Female	653 (100.0)	250 (38.3)	403 (61.7)	
Age-group:				
≤35 years	443 (100.0)	124 (28.0)	319 (72.0)	<0.001
36-60 years	464 (100.0)	160 (34.5)	304 (65.5)	
≥61 years	316 (100.0)	192 (60.8)	124 (39.2)	
District:				
Tirana	604 (100.0)	210 (34.8)	394 (65.2)	<0.001
Shkodra	312 (100.0)	87 (27.9)	225 (72.1)	
Vlora	307 (100.0)	179 (58.3)	128 (41.7)	
Place of residence:				
Urban areas	840 (100.0)	383 (45.6)	457 (54.4)	<0.001
Suburban areas	111 (100.0)	41 (36.9)	70 (63.1)	
Rural areas	272 (100.0)	52 (19.1)	220 (80.9)	
Educational level:				
Low (0-8 years)	226 (100.0)	87 (38.5)	139 (61.5)	0.001
Middle (9-12 years)	638 (100.0)	221 (34.6)	417 (65.4)	
High (≥13 years)	359 (100.0)	168 (46.8)	191 (53.2)	
Poverty:				
No	976 (100.0)	392 (40.2)	584 (59.8)	0.081
Yes	247 (100.0)	84 (34.0)	163 (66.0)	
Marital status:				
Other	435 (100.0)	149 (34.3)	286 (65.7)	0.014
Married	788 (100.0)	327 (41.5)	461 (58.5)	

* Absolute numbers and their respective *row* percentages (in parentheses).

† P-values from chi-square test.

The prevalence of antibiotic use in the last 6 months was only slightly higher in males than in females (40% vs. 38%, respectively), but this difference was not statistically significant (P=0.33). There was evidence of a graded relationship with age: the prevalence of antibiotic use in the last 6 months was the highest among the youngest (≤35 years) participants (72%) and the lowest among older (≥61 years) individuals (39%). Similar to the last month use, the prevalence of use in the past 6 months was the highest in Shkodra (72%), whereas in Vlora it was the lowest (42%). Overall, the prevalence of antibiotic use in the last 6 months was considerably higher in

rural areas compared with urban areas (81% vs. 54%, respectively, P<0.001). In addition, the prevalence of antibiotic use in the last 6 months was the lowest among the high-educated individuals (53%). Individuals who perceived themselves as poor reported a non-significantly higher frequency of antibiotic use in the last 6 months compared with their counterparts who did not perceive themselves as poor (66% vs. 60%, respectively, P=0.08). In turn, married participants had a lower prevalence of antibiotic use in the last 6 months compared with those who were single, divorced, or widowed (59% vs. 66%, respectively, P=0.01).

Antibiotic use in the last year

Table 4 presents the distribution of demographic characteristics and socioeconomic factors in the study sample by use of antibiotics in the last year.

Table 4. Distribution of demographic and socioeconomic characteristics by use of antibiotics in the last year

Variable	Total (N=1223)	Use of antibiotics in the last year		
		No (N=246)	Yes (N=977)	P†
Sex:				
Male	570 (100.0)*	107 (18.8)	463 (81.2)	0.284
Female	653 (100.0)	139 (21.3)	514 (78.7)	
Age-group:				
≤35 years	443 (100.0)	94 (21.2)	349 (78.8)	<0.001
36-60 years	464 (100.0)	112 (24.1)	352 (75.9)	
≥61 years	316 (100.0)	40 (12.7)	276 (87.3)	
District:				
Tirana	604 (100.0)	91 (15.1)	513 (84.9)	<0.001
Shkodra	312 (100.0)	33 (10.6)	279 (89.4)	
Vlora	307 (100.0)	122 (39.7)	185 (60.3)	
Place of residence:				
Urban areas	840 (100.0)	200 (23.8)	640 (76.2)	<0.001
Suburban areas	111 (100.0)	18 (16.2)	93 (83.8)	
Rural areas	272 (100.0)	28 (10.3)	244 (89.7)	
Educational level:				
Low (0-8 years)	226 (100.0)	36 (15.9)	190 (84.1)	0.001
Middle (9-12 years)	638 (100.0)	93 (14.6)	545 (85.4)	
High (≥13 years)	359 (100.0)	117 (32.6)	242 (67.4)	
Poverty:				
No	976 (100.0)	201 (20.6)	775 (79.4)	0.425
Yes	247 (100.0)	45 (18.2)	202 (81.8)	
Marital status:				
Other	435 (100.0)	94 (21.6)	341 (78.4)	0.334
Married	788 (100.0)	152 (19.3)	636 (80.7)	

* Absolute numbers and their respective *row* percentages (in parentheses).

† P-values from chi-square test.

The prevalence of antibiotic use in the last year was slightly higher in males than in females (81% vs. 79%, respectively), but this difference was not statistically significant (P=0.28). The prevalence of antibiotic use in the last year was the highest among older (≥61 years) individuals (87%) and the lowest among the middle-aged (36-60 years) participants (76%). The prevalence was the highest in Shkodra (89%), whereas in Vlora it was the lowest (60%). Overall, the prevalence of antibiotic use in the last year was higher in rural areas compared with urban areas (90% vs. 76%, respectively, P<0.001). Also, the prevalence of antibiotic use in the last year was the lowest in the high-educated individuals (67%). Individuals who perceived themselves as poor reported a non-significantly higher frequency of antibiotic use in the last year compared with their counterparts who did not perceive themselves as poor (82% vs. 79%, respectively, P=0.43). Married participants and those who were single, divorced, or widowed had a somehow similar prevalence of antibiotic use in the last year (81% vs. 78%, respectively, P=0.33).

Determinants of antibiotic use in the last month, in the last 6 months, and in the last year

Table 5 presents demographic and socioeconomic determinants of antibiotic use (in the last month, in the last 6 months, and in the last year).

Table 5. Determinants of antibiotic use in the last month, in the last 6 months, and in the last year; multivariable-adjusted odds ratios (ORs) from binary logistic regression

Variable	Last month		Last 6 months		Last year	
	OR (95%CI)*	P	OR (95%CI)*	P	OR (95%CI)*	P
Sex:						
Male	1.05 (0.81-1.36)	0.714	1.06 (0.81-1.38)	0.682	1.04 (0.76-1.43)	0.791
Female	1.00 (reference)		1.00 (reference)		1.00 (reference)	
Age-group:		**<0.001 (2)**†		**<0.001 (2)**		**0.013 (2)**
≤35 years	1.84 (1.24-2.73)	0.003	5.92 (3.99-8.80)	<0.001	0.69 (0.43-1.11)	0.122
36-60 years	1.91 (1.37-2.68)	<0.001	4.24 (3.01-5.96)	<0.001	0.53 (0.34-0.81)	0.004
≥61 years	1.00 (reference)	-	1.00 (reference)	-	1.00 (reference)	-
District:		**<0.001 (2)**		**<0.001 (2)**		**<0.001 (2)**
Shkodra	1.86 (1.38-2.58)	<0.001	1.43 (1.02-2.01)	0.037	1.39 (0.88-2.19)	0.158
Vlora	1.01 (0.72-139)	0.998	0.26 (0.19-0.37)	<0.001	0.21 (0.15-0.31)	<0.001
Tirana	1.00 (reference)	-	1.00 (reference)	-	1.00 (reference)	-
Place of residence:		**0.141 (2)**		**<0.001 (2)**		**<0.001 (2)**
Rural areas	1.37 (1.00-1.87)	0.052	2.74 (1.88-3.99)	<0.001	2.67 (1.66-4.28)	<0.001
Suburban areas	1.02 (0.63-1.65)	0.939	0.91 (0.59-1.47)	0.693	0.74 (0.40-1.36)	0.333
Urban areas	1.00 (reference)	-	1.00 (reference)	-	1.00 (reference)	-
Educational level:		**0.005 (2)**		**<0.001 (2)**		**<0.001 (2)**
Low (0-8 years)	1.70 (1.09-2.65)	0.019	1.90 (1.21-2.99)	0.005	2.02 (1.18-3.45)	0.010
Middle (9-12 years)	1.69 (1.23-2.32)	0.001	2.34 (1.71-3.20)	<0.001	2.98 (2.09-4.25)	<0.001
High (≥13 years)	1.00 (reference)	-	1.00 (reference)	-	1.00 (reference)	-
Poverty:						
Yes	1.28 (0.92-1.79)	0.150	1.50 (1.04-2.17)	0.032	1.08 (0.70-1.66)	0.740
No	1.00 (reference)		1.00 (reference)		1.00 (reference)	
Marital status:						
Married	1.86(1.36-2.55)	<0.001	1.01 (0.74-1.36)	0.996	1.34 (0.94-1.89)	0.104
Other	1.00 (reference)		1.00 (reference)		1.00 (reference)	

* Multivariable-adjusted odds ratios (ORs): use vs. no use (respectively: in the last month, in the last 6 months, and in the last year). All variables presented in the table were entered simultaneously into the logistic regression models.

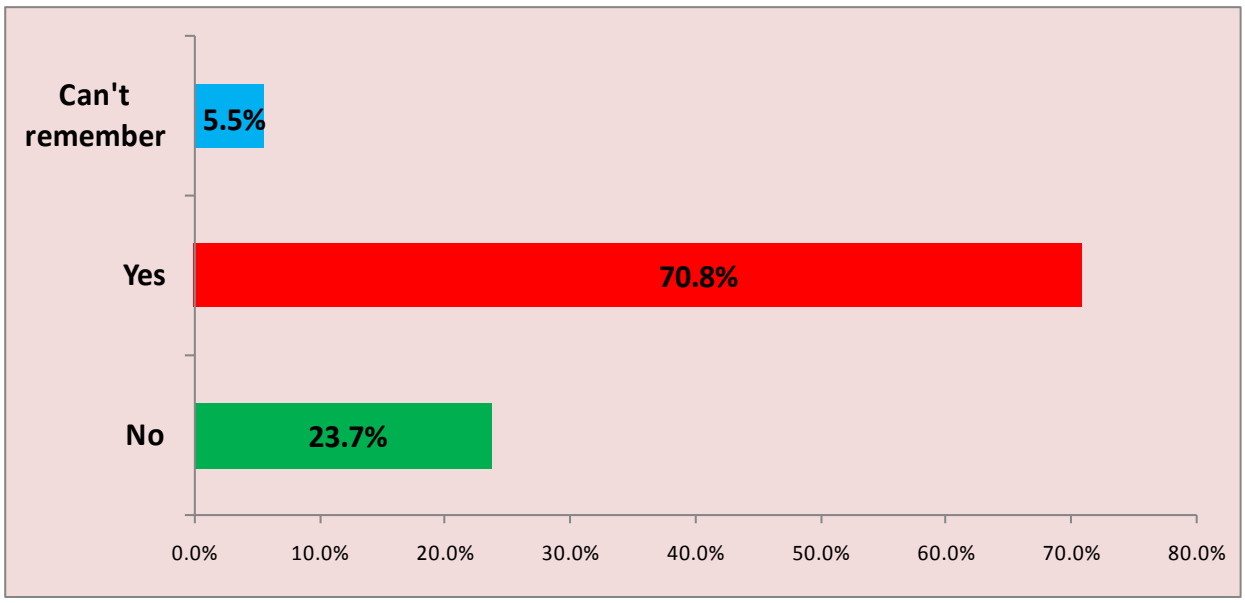
† Overall p-value and degrees of freedom (in parenthesis).

These estimates were based on binary logistic regression models with simultaneous adjustment for all the demographic and socioeconomic characteristics presented in Table 5.
Upon multivariable-adjustment for all covariates, significant "predictors" of antibiotic use in the last month were the following factors: middle-age (36-60 years) participants (OR=1.9, 95%CI=1.4-2.7), Shkodra residents (OR=1.9, 95%CI=1.4-2.6), rural residents (OR=1.4, 95%CI=1.0-1.9), low-educated and middle-educated individuals (OR=1.7, 95%CI=1.1-2.6 and OR=1.7, 95%CI=1.2-2.3, respectively) and participants who were currently married (OR=1.9, 95%CI=1.4-2.6).
On the other hand, in multivariable-adjusted logistic regression models, significant "determinants" of antibiotic use in the last 6 months were the following factors: younger age (≤35 years) and middle-age (36-60 years) participants (OR=5.9, 95%CI=4.0-8.8 and OR=4.2, 95%CI=3.0-6.0, respectively), Shkodra (positive association) and Vlora (inverse relationship) residents (OR=1.4, 95%CI=1.0-2.0 and OR=0.3, 95%CI=0.2-0.4, respectively), rural residents (OR=2.7, 95%CI=1.9-4.0), low-educated and middle-educated individuals (OR=1.9, 95%CI=1.2-3.0 and OR=2.3, 95%CI=1.7-3.2, respectively) and participants who perceived themselves as poor (OR=1.5, 95%CI=1.0-2.2).
Conversely, in multivariable-adjusted logistic regression models, significant positive correlates of antibiotic use in the last year were the following factors: rural residents (OR=2.7, 95%CI=1.7-4.3), as well as the low-educated and the middle-educated individuals (OR=2.0, 95%CI=1.2-3.5 and OR=3.0, 95%CI=2.1-4.3, respectively). In turn, middle-age (36-60 years) and Vlora residency were inversely related to antibiotic use in the last year (OR=0.5, 95%CI=0.3-0.8 and OR=0.2, 95%CI=0.1-0.3, respectively) [Table 5].

Obtaining antibiotics

Participants who reported use of antibiotics were subsequently asked if they had obtained the antibiotics upon a physician's prescription on the occasion/episode when they last received them. Findings related to this question are presented in Figure 3.

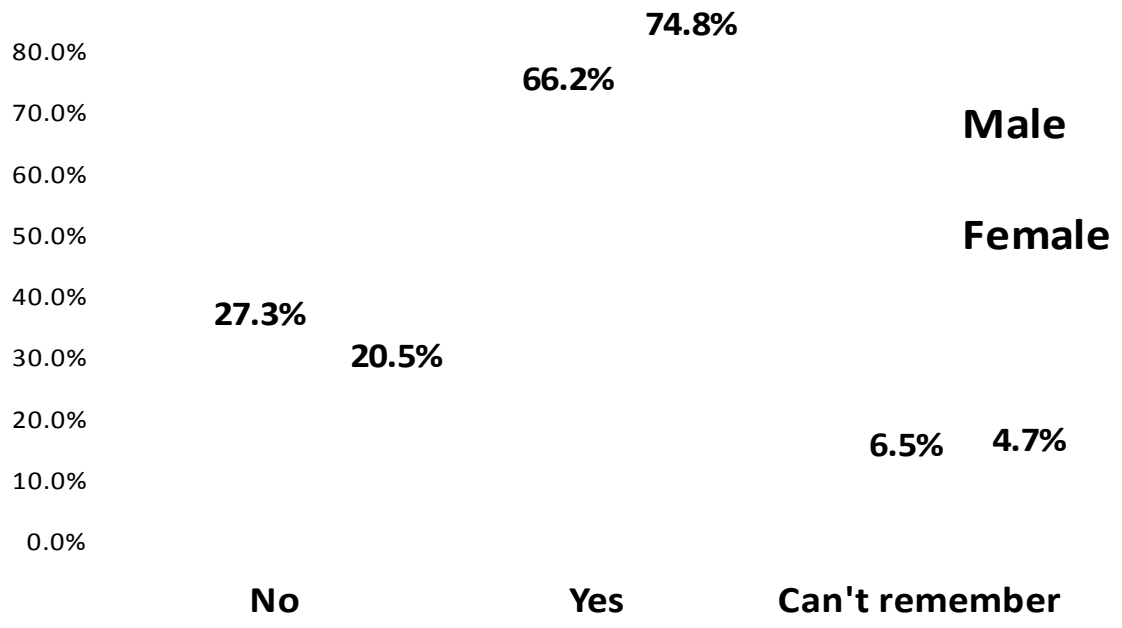
Figure 3. Physician's prescription for the last occasion/episode of use of antibiotics



Overall, the majority of survey participants (71%) reported that they obtained their antibiotics through a medical prescription (from their family physicians and/or specialists), whereas 24% did not get their antibiotics with a medical prescription. Conversely, about 5% of respondents could not remember whether they had obtained antibiotics upon medical prescription when they last used them.

There were significant sex differences regarding the way antibiotics were obtained. Hence, 75% of females reported a medical prescription for obtaining antibiotics compared with 66% of males (chi-square test: P=0.006) [Figure 4].

Figure 4. Physician's prescription for the last occasion/episode of use of antibiotics by sex



In addition, there was a graded relationship with age: about 78% of the youngest respondents obtained antibiotics upon medical prescription compared to 72% and 60% of middle-aged and older individuals, respectively (P<0.001) [Figure 5].

The medical prescription level was comparable in Tirana and Vlora districts (73% vs. 75%, respectively), but lower in Shkodra (63%), a finding which was statistically significant (chi-square test: P<0.001). The distribution of prescription status by district is presented in Figure 6.

Furthermore, the medical prescription level was higher in urban areas compared to suburban areas and especially rural areas. The distribution of prescription status by district is presented in Figure 7.

Figure 5. Physician's prescription for the last occasion/episode of use of antibiotics by age-group of survey participants

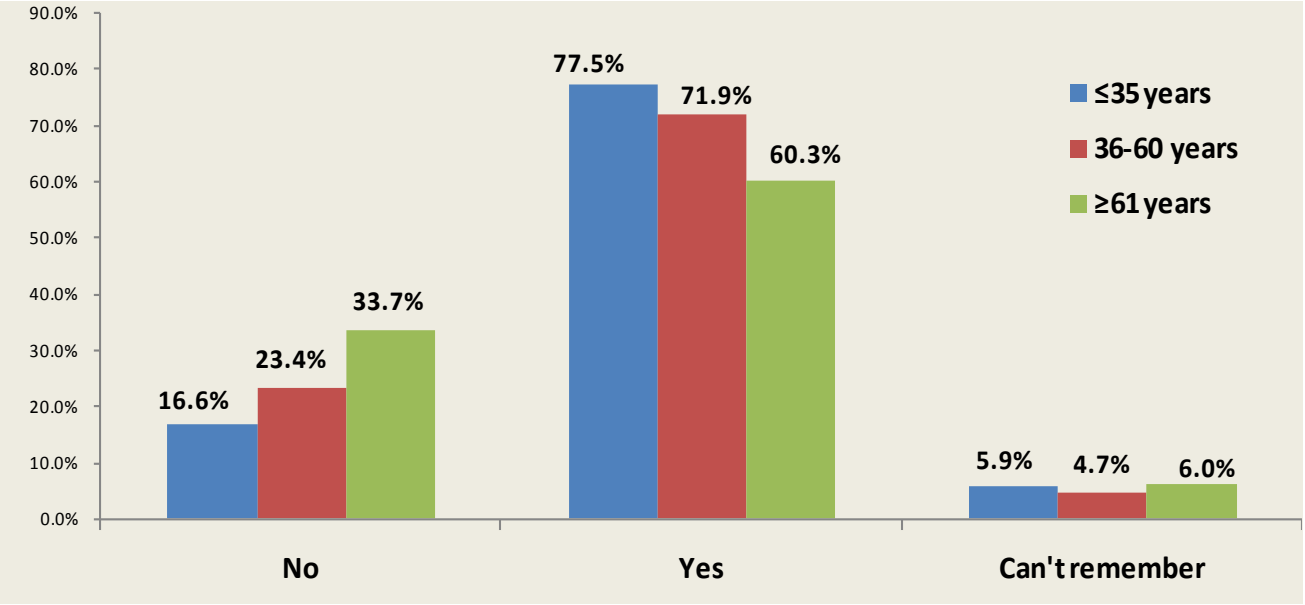


Figure 6. Physician's prescription for the last occasion/episode of use of antibiotics by district

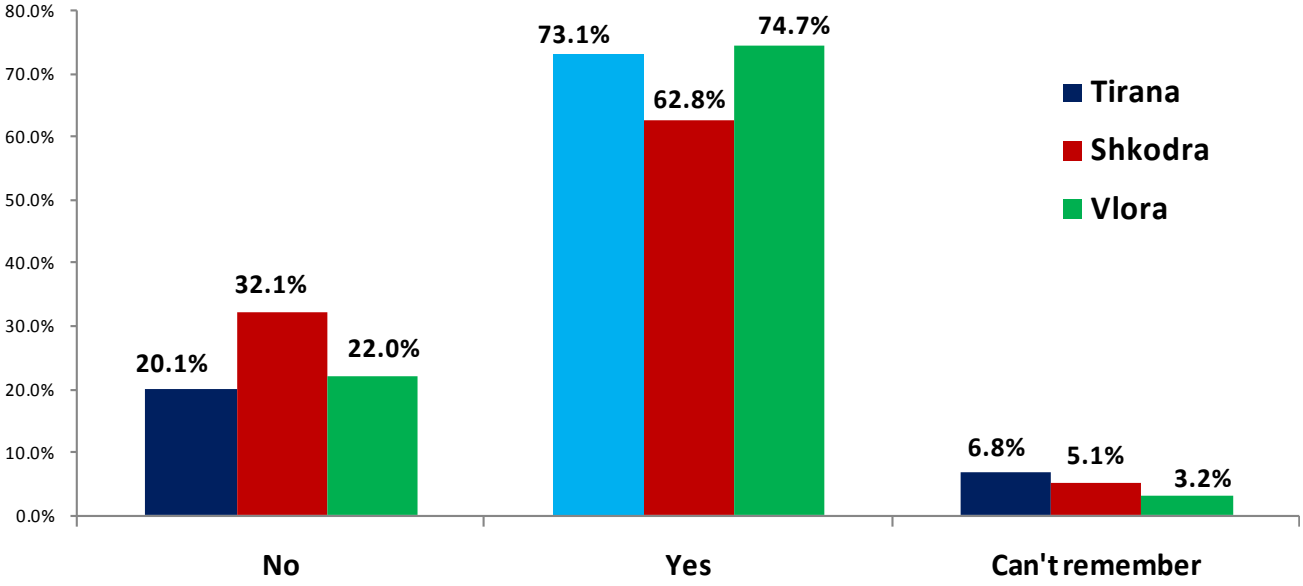
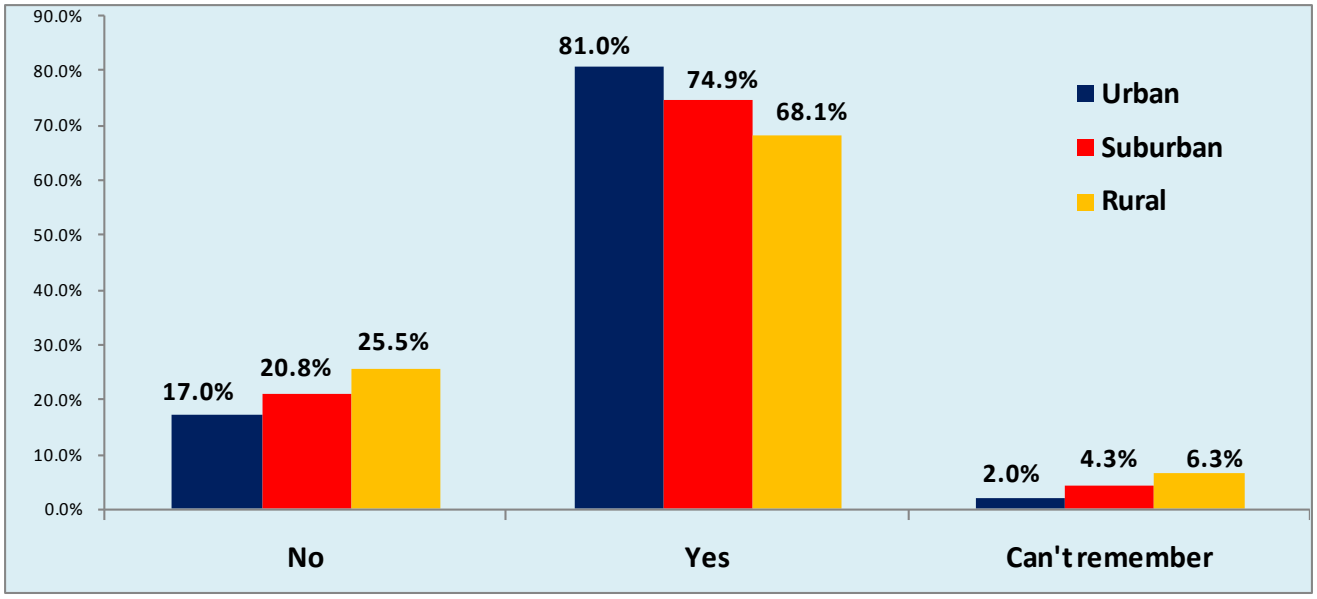


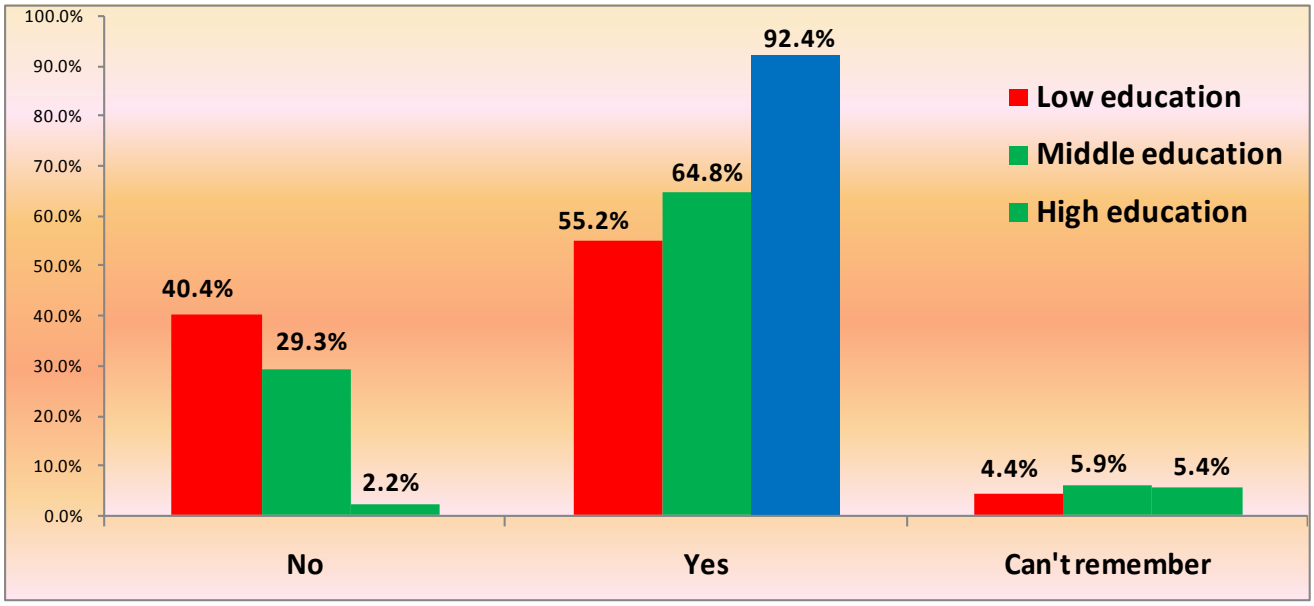
Figure 7. Physician's prescription for the last occasion/episode of use of antibiotics by place of residence



There was evidence of a graded relationship with educational attainment of survey participants: about 55% of individuals with 0-8 years of formal schooling reported medical prescription for getting antibiotics, compared to 65% and 92% of those with 9-12 years and ≥13 years of education, respectively (Figure 8).

On the other hand, there were no significant differences regarding the self-perceived poverty and/or marital status of study participants.

Figure 8. Physician's prescription for the last occasion/episode of use of antibiotics by educational attainment

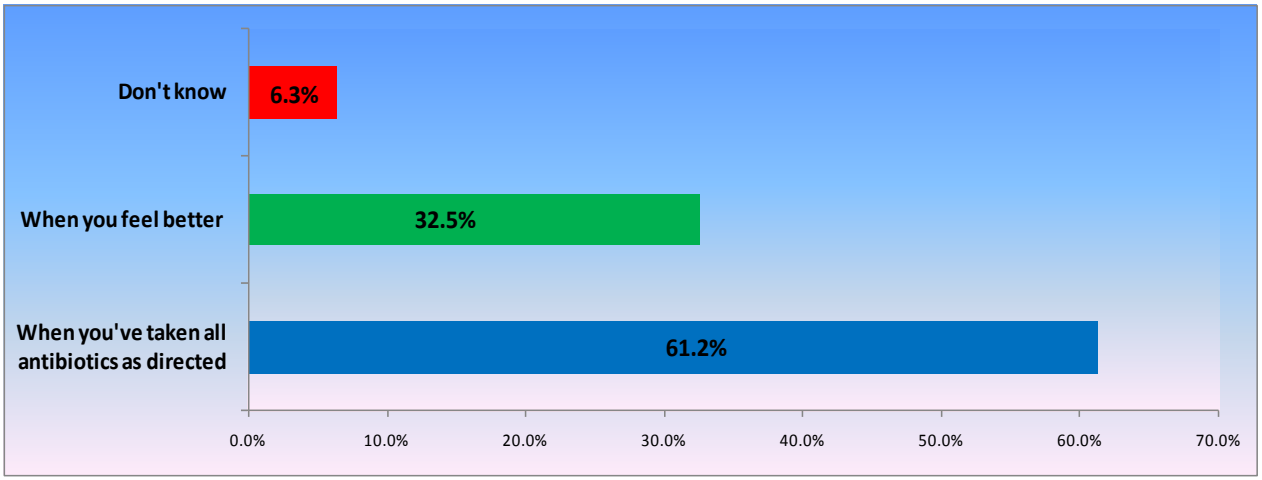


Knowledge about antibiotics

The knowledge about appropriate use of antibiotics included items on how and when to use antibiotics and what they should be used for.

Initially, participants were asked when they thought they should stop taking antibiotics once they had begun treatment: when they feel better, or when they have taken all the antibiotics as directed. It should be noted that WHO advises that individuals should always take the full prescription, even if they feel better earlier. Overall, the majority of respondents answered that the full course of antibiotics should be taken as directed (61%). Conversely, about 33% reported that antibiotics may be stopped when they feel better, whereas the remaining 6% of individuals did not have an opinion on this item. These findings are illustrated in Figure 9.

Figure 9. Knowledge about correct interruption of antibiotics once treatment has started



There was a positive association of proper knowledge about use of antibiotics (that is interruption of use only after taking all the antibiotics as directed) with older age, a higher educational attainment and urban residence. These findings are summarized in Figures 10-12.

Figure 10. Knowledge about correct interruption of antibiotics by age-group

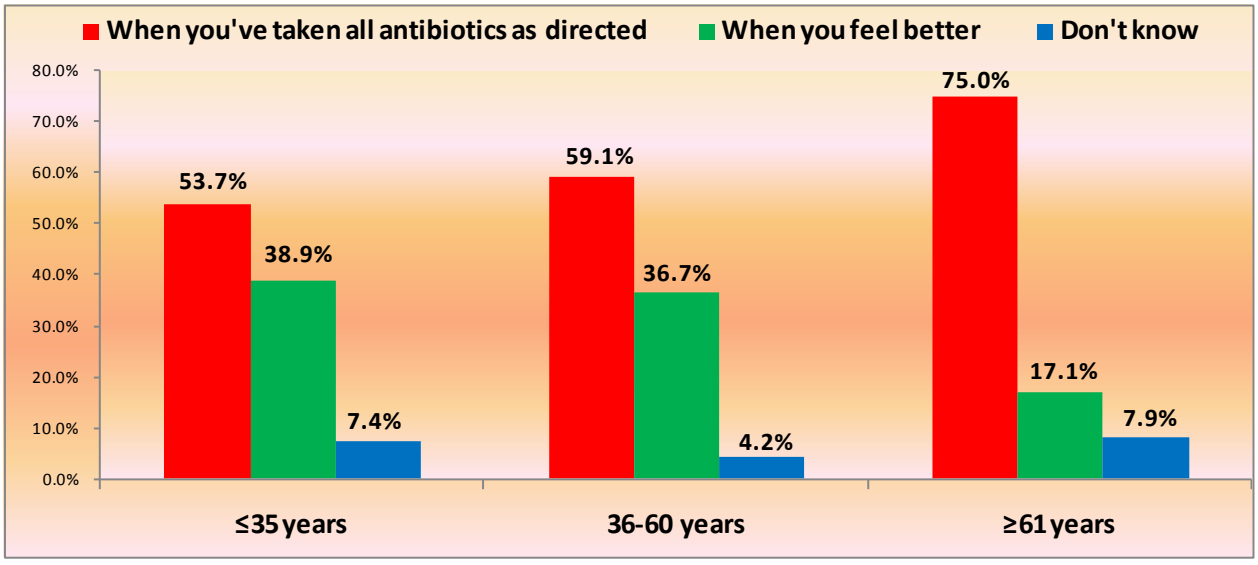


Figure 11. Knowledge about correct interruption of antibiotics by educational level

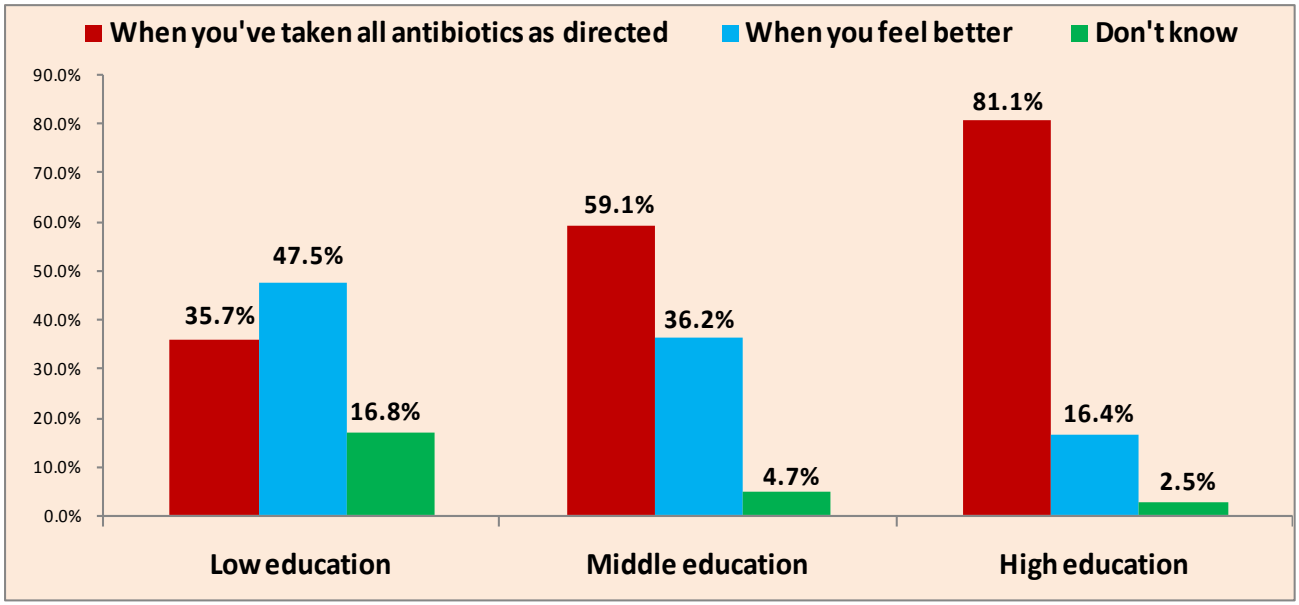
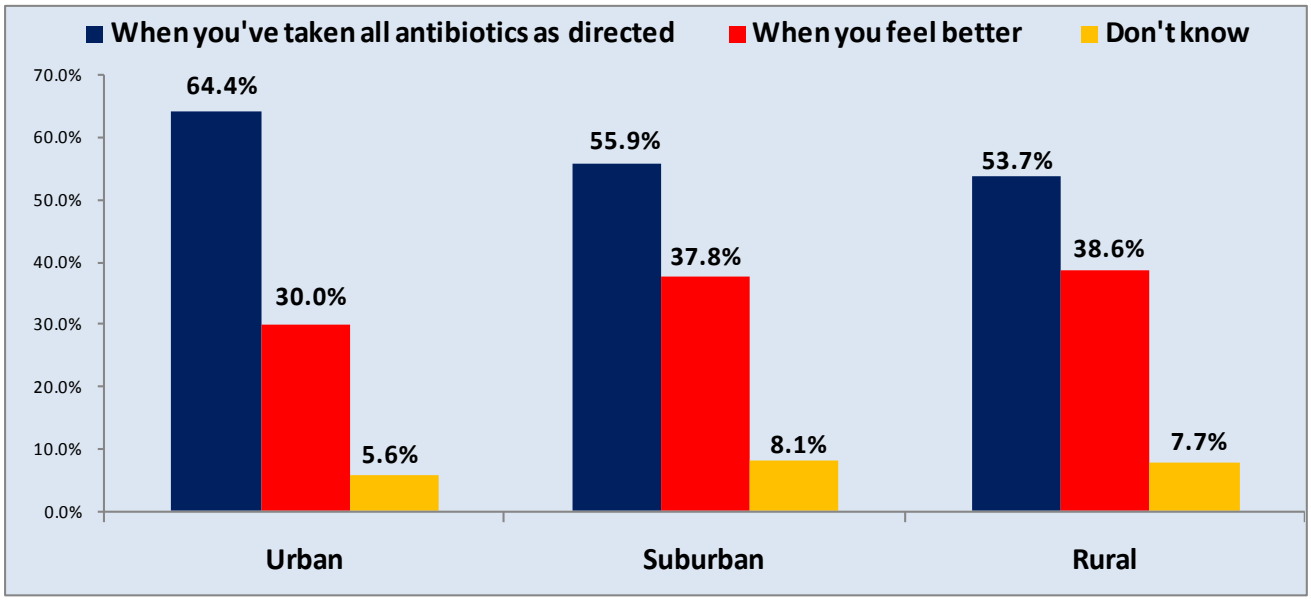


Figure 12. Knowledge about correct interruption of antibiotics by place of residence

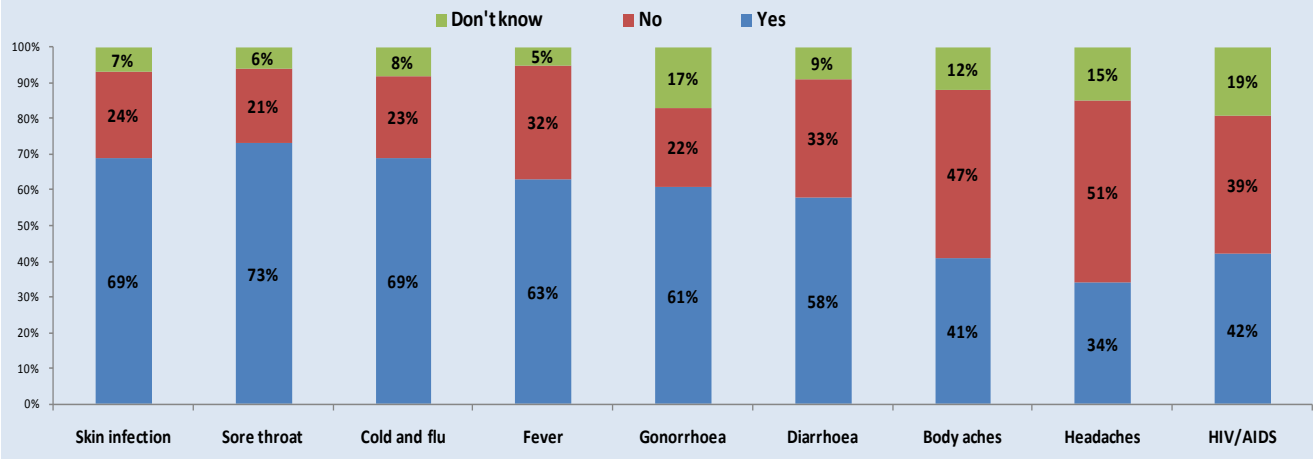


On the other hand, there was no significant relationship between knowledge about correct use of antibiotics and gender, self-perceived poverty level, marital status, or district included in the survey (Tirana, Shkodra and Vlora).

Subsequently, participants were asked about selected conditions/diseases that antibiotics should be used to treat. More specifically, respondents were asked which of a list of medical conditions can be treated with antibiotics, based on the multi-country survey conducted by WHO (published in 2015).

This list was slightly adapted for the context of Albania and included conditions/diseases that can be treated with antibiotics (such as skin/wound infection, and gonorrhoea), as well as several conditions/diseases that should not be treated with antibiotics. The overall findings related to this item are summarized in Figure 13.

Figure 13. Conditions that antibiotics should be used to treat



As shown in Figure 13, the majority of respondents (69%) correctly identified skin/wound infections as conditions which can be treated with antibiotics. However, only 61% of respondents correctly identified gonorrhoea as a condition which is treatable by antibiotics.

On the other hand, there was a considerable share of participants who mistakenly considered that conditions which are usually viral, and therefore do not respond to antibiotics, can be treated with antibiotics.

In particular, 73% of individuals erroneously considered that sore throats can be treated with antibiotics. Furthermore, 69% of participants stated that common colds and flu should be treated with antibiotics.

Also, 41% and 34% of individuals deemed appropriate the use of antibiotics for general body aches and headaches, respectively.

There was evidence of significant demographic and socioeconomic differences regarding the use of antibiotics for the treatment of the aforementioned conditions/diseases. Thus, younger participants, those with a lower educational attainment and respondents from suburban and rural areas had a lower level of knowledge about the conditions/diseases that should be treated with antibiotics.

Conversely, there were no statistically significant differences regarding sex, marital status, self-perceived poverty level, or the districts included in the survey (Tirana, Vlora and Shkodra).

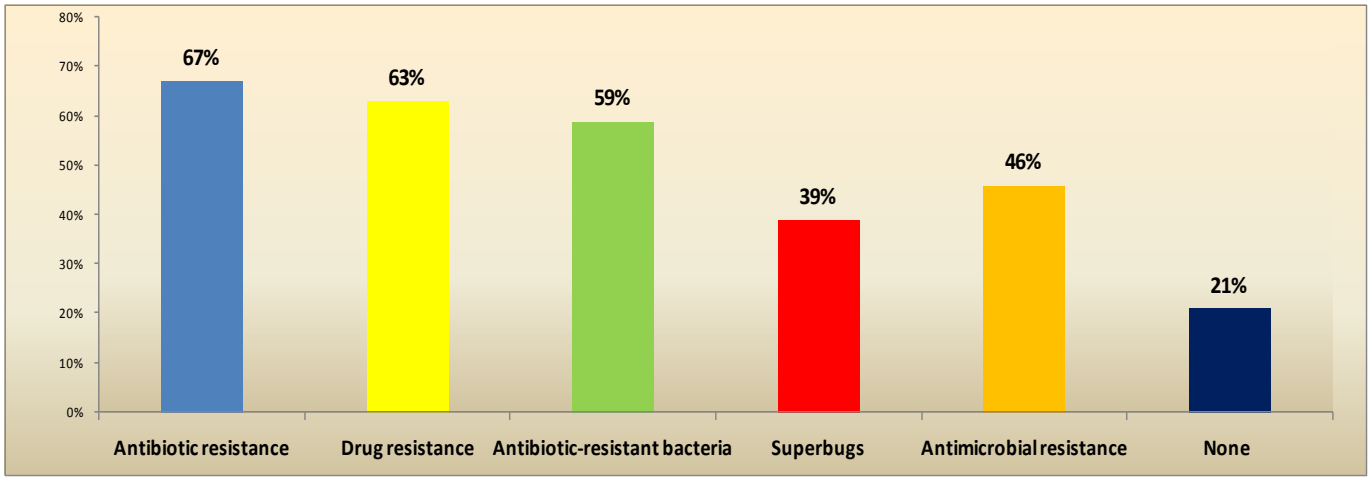
Knowledge about antibiotic resistance

In addition, participants were asked about their level of awareness of the issue of antibiotic resistance and levels of understanding and appropriate measure for addressing this important public health challenge.

Initially, respondents were asked whether they had heard of a series of terms commonly used in relation to the issue of antibiotic resistance. These terms included the following: antibiotic resistance; drug resistance; antibiotic-resistant bacteria; superbugs; and antimicrobial resistance.

Figure 14 presents the overall findings related to this issue.

Figure 14. Proportions of participants who answered "yes" to the question: *"Have you heard of any of the following terms…"*



Overall, 67% of participants had heard about antibiotic resistance; 63% had heard about the term drug resistance; 59% had heard about antibiotic-resistant bacteria; and 46% had heard about antimicrobial resistance. Only 39% had heard about superbugs, whereas 21% of individuals included in this survey had not heard any of the aforementioned terms.

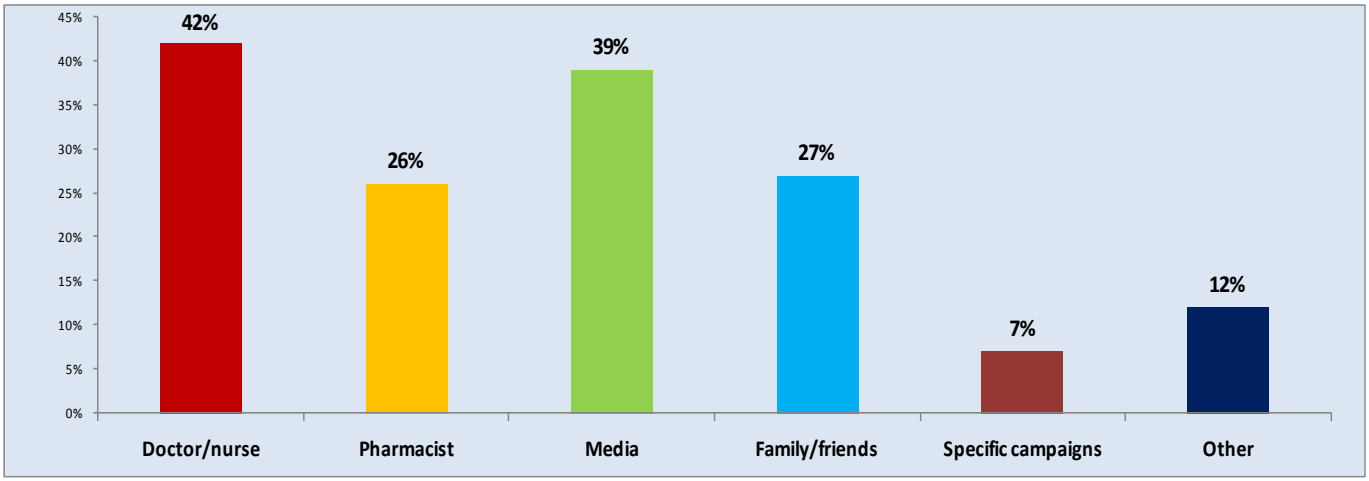
Similar to the correct use of antibiotics, there was evidence of significant demographic and socioeconomic differences regarding the knowledge about the terms related to antibiotic resistance. Hence, a significantly lower proportion of younger participants, those with a lower educational attainment and respondents from suburban and rural areas had heard about the abovementioned terms related to antibiotic resistance.

On the other hand, there were no statistically significant differences regarding sex, marital status, self-perceived poverty level, or the districts included in the survey (Tirana, Vlora and Shkodra).

Subsequently, participants were asked about the sources of information related to the term *"antibiotic resistance"*. Potential sources of information included health professionals (physicians or nurses), pharmacists, media, family or friends, specific campaigns, or other sources of information.

Figure 15 presents the overall findings related to the sources of information about antibiotic resistance.

Figure 15. Proportions of responses from all participants to the question: *"Where did you hear about the term antibiotic resistance"*



Overall, health professionals (doctors and nurses) constituted the most frequent source of information about antibiotic resistance (42%) followed by the media (39%) consisting of TV, radio or newspapers. These two sources were followed by family and/or friends (27%) and pharmacists (26%). In addition, specific campaigns targeting antibiotic resistance were reported by 7% of participants. Finally, 12% of individuals reported other courses of information.

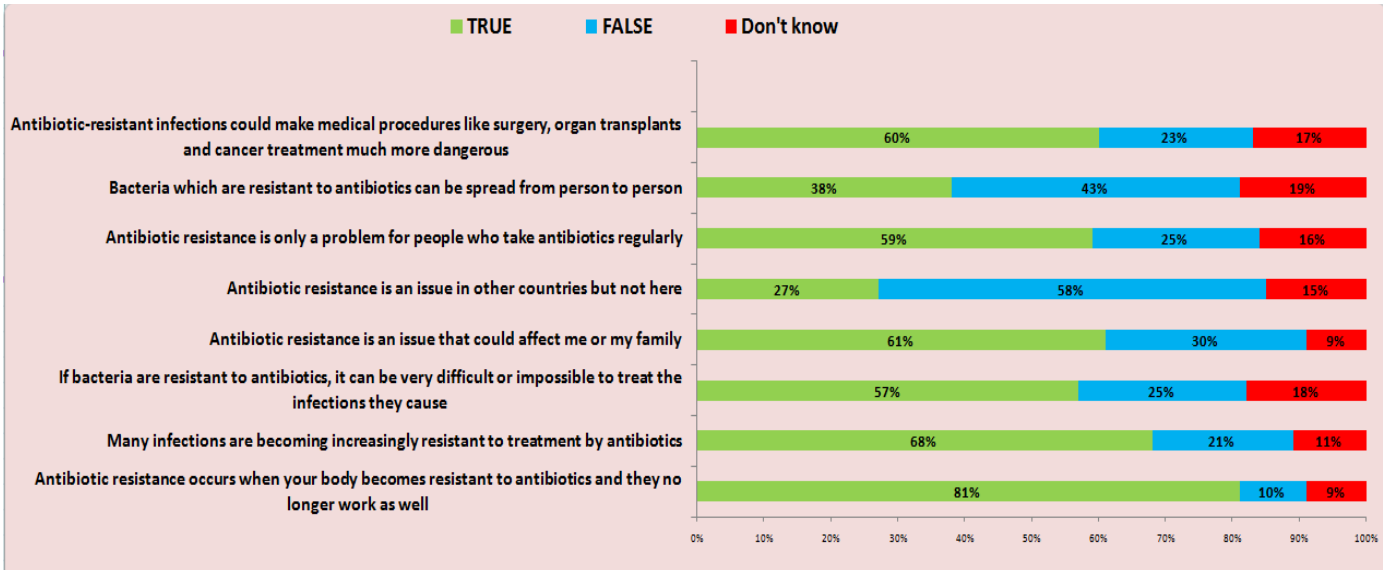
Understanding of the issue of antibiotic resistance

Subsequently, participants were presented with a list of statements and asked whether they were true or false. This was done in order to explore levels of understanding of the issue of antibiotic resistance. The statements and their correct answers (in parentheses) are listed below:

- Antibiotic resistance occurs when your body becomes resistant to antibiotics and they no longer work as well (FALSE)
- Many infections are becoming increasingly resistant to treatment by antibiotics (TRUE)
- If bacteria are resistant to antibiotics, it can be very difficult or impossible to treat the infections they cause (TRUE)
- Antibiotic resistance is an issue that could affect me or my family (TRUE)
- Antibiotic resistance is an issue in other countries but not here (FALSE)
- Antibiotic resistance is only a problem for people who take antibiotics regularly (FALSE)
- Bacteria which are resistant to antibiotics can be spread from person to person (TRUE)
- Antibiotic-resistant infections could make medical procedures like surgery, organ transplants and cancer treatment much more dangerous (TRUE)

Figure 16 presents the overall findings related to the level of understanding of participants regarding the issue of antibiotic resistance.

Figure 16. Proportions of responses from all participants to statements aiming at assessing the level of understanding of antibiotic resistance



Overall, several statements were correctly identified by the majority of participants.

Hence, 68% of participants correctly identify: *"Many infections are becoming increasingly resistant to treatment by antibiotics"* as a true statement.

Nevertheless, there were some other statements which were wrongly identified by survey participants, as shown in Figure 16. This indicates that there are high levels of misunderstanding about many aspects of antibiotic resistance in Albanian adults.

Thus, a very big proportion of individuals (81%) think that the statement: *"Antibiotic resistance occurs when your body becomes resistant to antibiotics and they no longer work as well"* is also true, when this is in fact a false statement.

Furthermore, only 38% of participants considered that the correct statement: *"Bacteria which are resistant to antibiotics can be spread from person to person"* is true. Another gap relates to the false statement: *"Antibiotic resistance is only a problem for people who take antibiotics regularly"*, where 59% of participants erroneously considered this as a true statement.

DISCUSSION

Key findings

Key findings of this survey including a representative sample of adult primary health care users in Albania are summarized below:

Prevalence and socio-demographic correlates of antibiotic use:

- Overall, 31% of participants included in this survey reported use of antibiotics in the last month; further 30% reported use in the last 6 months; 19% in the last year; 12% more than a year ago, whereas 4% of individuals had never used antibiotics.
- The prevalence of *antibiotic use in the last month* was considerably higher in rural areas compared with urban areas (41% vs. 28%, respectively, P<0.001); in the low-educated individuals compared with the high-educated participants (38% vs. 23%, respectively, P<0.001); and in individuals who perceived themselves as poor compared with those who did not perceive themselves as poor (38% vs. 29%, respectively, P=0.009).
- The prevalence of *antibiotic use in the last 6 months* was the highest among the youngest (≤35 years) participants (72%) and the lowest among older (≥61 years) individuals (39%). Similar to the last month use, the prevalence of antibiotic use in the last 6 months was considerably higher in rural areas compared with urban areas (81% vs. 54%, respectively, P<0.001); in the low-educated individuals compared to those with a higher educational attainment (62% vs. 53%, respectively); and in individuals who perceived themselves as poor compared with their counterparts who did not perceive themselves as poor (66% vs. 60%, respectively, P=0.08).
- The prevalence of antibiotic use in the last year was the highest among older (≥61 years) individuals (87%) and the lowest among the middle-aged (36-60 years) participants (76%). Furthermore, it was higher in rural areas compared with urban areas (90% vs. 76%, respectively, P<0.001); and in the low-educated participants compared with their highly educated counterparts (84% vs. 67%, respectively).

Obtaining antibiotics:

- Among participants who reported use of antibiotics, 71% of them reported that they obtained their antibiotics through a medical prescription (from their family physicians and/or specialists), whereas 24% did not get their antibiotics with a medical prescription. There were significant sex differences regarding the way antibiotics were obtained: 75% of females reported a medical prescription for obtaining antibiotics compared with 66% of males (P=0.006). In addition, there was a graded relationship with age: about 78% of the youngest respondents obtained antibiotics upon medical prescription compared to 72% and 60% of middle-aged and older individuals, respectively (P<0.001). Also, there was evidence of a linear association with educational attainment: about 55% of individuals with 0-8 years of formal schooling reported medical prescription for getting antibiotics, compared to 65% and 92% of those with 9-12 years and ≥13 years of education, respectively. Furthermore, the medical prescription level was higher in urban areas compared to suburban areas and especially rural areas.

Knowledge about antibiotics:

- Overall, 61% of participants answered (correctly) that the full course of antibiotics should be taken as directed. Conversely, about 33% reported that antibiotics may be stopped when they feel better. There was a positive association of proper knowledge about use of antibiotics (that is interruption of use only after taking all the antibiotics as directed) with older age, a higher educational attainment and urban residence.
- The majority of respondents (69%) correctly identified skin/wound infections as conditions which can be treated with antibiotics. However, only 61% of respondents correctly identified gonorrhoea as a condition which is treatable by antibiotics. On the other hand, there was a considerable share of participants who mistakenly considered that conditions which are usually viral, and therefore do not respond to antibiotics, can be treated with antibiotics. In particular, 73% of individuals erroneously considered that sore throats can be treated with antibiotics. Furthermore, 69% of participants stated that common colds and flu should be treated with antibiotics. Also, 41% and 34% of individuals deemed appropriate the use of antibiotics for general body aches and headaches, respectively. In general, younger participants, those with a lower educational attainment and respondents from suburban and rural areas had a lower level of knowledge about the conditions/diseases that should be treated with antibiotics.

Knowledge about antibiotic resistance:

- Overall, 67% of participants had heard about antibiotic resistance; 63% had heard about the term drug resistance; 59% had heard about antibiotic-resistant bacteria; and 46% had heard about antimicrobial resistance. Only 39% had heard about superbugs, whereas 21% of individuals included in this survey had not heard any of the aforementioned terms. Similar to the correct use of antibiotics, a significantly lower proportion of younger participants, those with a lower educational attainment and respondents from suburban and rural areas had heard about the aforementioned terms related to antibiotic resistance.
- Health professionals (doctors and nurses) constituted the most frequent source of information about antibiotic resistance (42%) followed by the media (39%) consisting of TV, radio or newspapers. These two sources were followed by family and/or friends (27%) and pharmacists (26%).

Understanding the issue of antibiotic resistance:

- Several statements related to a proper understanding of antibiotic resistance were correctly identified by the majority of study participants. Nevertheless, there were some other statements which were wrongly identified by survey respondents, indicating that there are high levels of misunderstanding about many aspects of antibiotic resistance among Albanian adults.

Comparison of Albanian findings with other countries

The prevalence of antibiotic use in the current study conducted in transitional Albania was higher than in several countries included in the fairly recent multi-country survey conducted by WHO and published in 2015[9]. Hence, the prevalence of last month use of antibiotics in the current study in Albania was 31%, which is significantly higher than in the neighboring Serbia (19%), or Barbados (19%), Russian Federation (25%), or China (28%). The Albanian estimate on last month use of antibiotics is comparable with Indonesia and South Africa (30% and 31%, respectively), but lower than in Viet Nam (38%), Nigeria (40%), Mexico (43%), India and Sudan (48% and 49%, respectively) and especially Egypt (54%). The average value of last month use of antibiotics in the 12 countries included in the WHO survey was 35%, which is slightly higher than the estimate obtained in the current study in Albania (31%).

On the other hand, the prevalence of antibiotics use in the last 6 months (excluding last month use) in Albania was 30%, which is comparable with Serbia and China (29% in both) and the Russian Federation (31%). In Albania, the prevalence of last six month use including the use in the last month was 61%, which is slightly lower than the average of the estimate in 12 countries included in the survey conducted by WHO and published in 2015 (65%). Notably, the prevalence of antibiotic use in the last six months was about 76% in Egypt, Sudan and India.

Similar to the multi-country survey conducted by WHO, the evidence from the current study carried out in Albania indicated that younger participants were more likely than their older counterparts to report recent use of antibiotics. Furthermore, findings obtained in Albania are compatible with the general trend in the multi-country survey conducted by WHO with regard to income level. Hence, low-income participants were more likely to use antibiotics in the past month than those with higher income. Similarly, a lower educational attainment was associated with a higher prevalence of antibiotic use in Albania, a finding which is in line with reports from most countries included in the multi-country survey conducted by WHO.

In the WHO multi-country survey, overall, the absolute majority of respondents (81%) reported that they got their antibiotics (or a prescription for them) from a doctor or nurse. This was relatively consistent across the 12 countries surveyed. In the current study conducted in Tirana, among participants who reported use of antibiotics, 71% of them reported that they obtained their antibiotics through a medical prescription (from their family physicians and/or specialists). This is lower than in South Africa (93%), Mexico (92%), Barbados and Sudan (91% in each) and India (90%), but higher than in the Russian Federation where it was the lowest (only 56%).

In Albania, 61% of participants answered (correctly) that the full course of antibiotics should be taken as directed. This is somehow comparable with the average estimate of the 12 countries included in the WHO survey, where 64% of respondents answered that the full course of antibiotics should be taken as directed. This was the highest in South Africa, where 87% of participants stated that the full course should be taken as directed. Conversely, more than half of the survey respondents in Sudan (62%), Egypt (55%) and China (53%) reported the incorrect option, stating that they should stop taking antibiotics when they feel better.

Compared with the average estimates from 12 countries included in the WHO survey, in Albania, there were higher levels of misunderstanding about many aspects of antibiotic resistance, an issue which raises serious concerns.

[9] WHO. Antibiotic resistance: Multi-country public awareness survey. Geneva, Switzerland; 2015. ISBN: 9789241509817.

Conclusions

This is one of the very first reports informing about the level of knowledge, attitude and practices of the Albanian adult population regarding the antibiotic resistance. The current survey provides a snapshot of current public awareness and common behaviors related to antibiotics in a former communist country in the Western Balkans which is undergoing a rapid transition associated with deep reforms including also the health care sector.

This survey conducted in Albania provides a series of important findings in relation to the use of antibiotics, levels of knowledge about appropriate use, understanding of the problem of antibiotic resistance and what can and should be done about this important issue.

Antibiotic resistance is one of the biggest threats to global health. It can affect anyone, of any age, in any country. Although antibiotic resistance occurs naturally, overuse and misuse of antibiotics in humans and animals is accelerating the process. As suggested by the WHO[10], steps can and should be taken at all levels of society to reduce the impact and limit the spread of resistance, including the public, who can help by preventing infection through good hygiene and vaccination, only using antibiotics when prescribed by a certified health professional, taking the full course, and never sharing or using left-over antibiotics.

Therefore, based on all these considerations, it is of vital importance for the people to understand the problem, and the way in which they can change their behavior. From this viewpoint, findings of this survey suggest a series of actions to undertake in Albania at both central and local level. More specifically, the findings of this study suggest that although people somehow recognize the problem of antibiotic resistance, they do not fully understand what causes it, or what they can do about this issue.

Findings of this survey may help health professionals, policymakers and decision-makers in Albania to design appropriate and cost-effective strategies and interventions for the control and prevention of antibiotic resistance in the general population. From this point of view, findings of the current study can both help shape future public awareness efforts and aid evaluation of the impact of these efforts in the context of Albania.

Nonetheless, a rigorous response to the issue of antibiotic resistance requires strong leadership, advocacy, and resources. Hence, the Albanian government must play a central role in providing stewardship and coordination. Stewardship starts with the legal, policy and regulatory framework that cover all aspects of drug supply and use. In the context of antibiotic resistance it is also important to bring together departments across sectors represented in the Albanian government, along with the relevant private and non-governmental organizations to ensure synergy and increase efficiency of all interventions and actions[11].

In conclusion, further studies should be conducted in Albania including nationwide population-representative samples of adults in order to confirm and replicate the findings of the current survey. In any case, this report provides important clues for policy formulation and evidence-based decision-making in Albania.

[10] WHO. Antibiotic resistance: Multi-country public awareness survey. Geneva, Switzerland; 2015. ISBN: 9789241509817.

[11] WHO Regional Office for Europe. Aide memoire AMR mission to Albania. Tirana: November 24-27, 2014.

Recommendations

The main findings from the current survey conducted in Albania point to the following:

- The need to better understand why antibiotics are being used so frequently in Albania without having been prescribed by health professionals.
- The need to increase public awareness and education so that people better understand:
    - Which conditions/diseases can be treated with antibiotics and which cannot.
    - Why antibiotics should only be taken when they have been prescribed to a specific individual for a particular episode of illness.
    - The importance of taking the full prescription as prescribed.

All these points have been also recommended by the recent WHO multi-country survey report published in 2015[12].

In the specific context of Albania, the following recommendations have been also suggested[13]:

- *National coordination:*
    - Use the mechanism in place to assume an inter-sectoral steering role (coordinating mechanism), mandated to establish a strong and effective partnership with all stakeholders.
    - Ensure that the committee is supported by a secretariat with the resources, skills and authority required to coordinate action across government entities.
    - Develop a national antimicrobial resistance action plan, based on a needs assessment, with a clear strategy, prioritized annual and aligned with other national health plans and strategies.
    - Provide adequate resources for capacity building, including basic, continuous and refresher training at all levels within the national antimicrobial resistance action plan.
- *Surveillance of antibiotic use and antibiotic resistance:*
    - A national surveillance system, guided by international standards, should be developed to collect, analyze and report relevant data on occurrence and trends of resistance in relevant pathogens including alerts on the identification of newly emerging resistance. Sources of information should include hospitals, public and private clinical and non-clinical laboratories and preferably food and veterinary laboratories.
    - The routine collection of samples should be based on strict case definitions. Samples could be analyzed locally to support capacity building at the local level, but they should also be sent to the national reference laboratory for confirmation of results, storage, aggregation of results and interpretation. This will also serve to strengthen the capacity and the position of the national reference laboratory. WHO should provide tools and expertise to support all steps of development of the Albanian surveillance system.
    - Establish systems for recording the use of antibiotics in hospitals and other health facilities and link these findings to antimicrobial resistance surveillance data.

[12] WHO. Antibiotic resistance: Multi-country public awareness survey. Geneva, Switzerland; 2015. ISBN: 9789241509817.

[13] WHO Regional Office for Europe. Aide memoire AMR mission to Albania. Tirana: November 24-27, 2014.

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