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Original Article

# Evaluation of the Knowledge, Attitude and Public Awareness about the Use of Antibiotics and Antibiotic Resistance in Albania

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## ABSTRACT

**Aim:** Antibiotic-Resistance remains a major risk to the general public's health. To assess public awareness about antibiotics usage and antibiotic resistance, survey-based research was conducted during October-December 2022 in Tirana, Albania. The aim of this research is to analyze the general public's level of knowledge and awareness of antibiotic use and resistance to antibiotics as well as to identify the demographic traits associated with them. **Materials and Methods:** A validated survey was used to collect the data. The survey was organized into four sections to gather information on socio-demographic traits, antibiotic use, knowledge on antibiotics, and antibiotic resistance. A Chi-square test was used to identify the associations between categorical variables. A *p*-value of 5% or less was considered significant for any test performed. **Results:** The study participants showed an overall good general knowledge of antibiotic resistance. The level of knowledge was significantly related with gender ($p$=0.005), education ($p$=0.018), and age ($p$<0.001). The settlement category appeared to be significantly associated with self-medication ($p$=0.020). Our findings imply that although individuals acknowledge the issue of antibiotic resistance, they are not fully informed about the causes and their personal role for preventing its spread. **Conclusion:** This research can serve as a baseline for further interventions addressing these issues and encouraging the proper use of antibiotics in the local context.

**Keywords:** Antibiotics, Antibiotic Resistance, Knowledge, Awareness.

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## INTRODUCTION

Antibiotics remain one of the 20th century's greatest accomplishments.[1,2] However, the irrational use of antibiotics has made bacterial resistance more and more a worldwide public health threat.[3,4] Furthermore, there is a decline in the research and discovery of novel antibiotics over the past two decades.[5-7] This situation calls for increasing awareness of antibiotic resistance and promoting best practices among the general public, government, and medical experts. People's beliefs, and attitude toward antibiotics and antibiotic resistance is influenced by their knowledge about this class of drugs.[8,9] Research shows that there is a higher chance for patients to get an antibiotic prescription by a doctor when they expect one.[10,11] Additionally, in countries with high levels of antibiotic resistance, there is less public awareness of the issue. For instance, EU countries such as Sweden and the Netherlands, which have a low use of antibiotics, have reported a higher level of population knowledge.[12,13] Regarding the situation in Albania, antibiotics belong to the class of medications that are available only through a prescription by a physician. However, Albania has experienced a considerable rise in the number of community pharmacies in recent years, which has made it challenging to execute inspections.[14] In addition, another study showed over-the-counter sales of antibiotics in 80% of Albanian pharmacies.[15] Considering this challenge, it is important to understand the current public knowledge and attitude towards antibiotics use and identify misconceptions among the general population. Our study aims to analyze the level of knowledge, attitude, and awareness of the Tirana population regarding the usage of antibiotics and antibiotic resistance as well as to identify the sociodemographic characteristics associated to these issues.

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## MATERIALS AND METHODS

This research was conducted over October-December 2022 (both inclusive) using a pre-tested and validated questionnaire as a research instrument.[16] The questionnaire was administered through direct interviews and was divided into four parts. The

first part collected data about the socio-demographic traits of respondents such as gender, age group, residence, education level, and income level. Other sections gathered information about the prevalence of antibiotics used by respondents, attitudes, and knowledge on antibiotics and antibiotic resistance. The questionnaire included structured questions which were previously tested for clarity and readability using a pilot study consisting of 50 individuals. The data from the pilot study were used to correct and adjust the final form of our questionnaire. Quantitative data were analyzed through descriptive statistics. The size of the study sample was determined using the Raosoft sample size calculator. The estimated minimum size of the sample was 384 people (margin of error 5%; confidence level 95%). Considering the effect of the response rate, we increased this number with 50% so our research set out to include 576 people using random sampling method. The survey was administrated to the participants who were 18 years and above, from one of the 10 most populated cities in Albania, including rural and urban areas (Tiranë, Durrës, Elbasan, Vlorë, Shkodër, Pogradec, Fier, Korçë, Berat, Gjirokastër,). A Chi-square test was used to identify the associations between categorical variables. A p-value of 5% or less was considered significant for any test performed. We evaluated the respondents' knowledge of antibiotic resistance by asking them to respond with "true" or "false" to eight statements giving a score of 1 for correct responses and 0 for incorrect ones. After calculating the total scores for everyone, we classified their knowledge level on antibiotic resistance into three categories (poor knowledge for those who scored≤25%; sufficient knowledge for those scoring between 25 and 75%, and good knowledge for those who scored≥75%).[16]

## RESULTS

A total of 502 individuals (40.6% males and 59.4% females) successfully responded to all the questions indicating a response rate of 87.15%. Concerning the level of education, 6.0% of the respondents had only primary school, and just 43.0% received a university degree (Bachelor/Master/PhD). Most of the surveyed individuals (58.2%) lived in urban areas. The majority of participants (54.6%) declared middle income, while 25.9% perceived themselves as poor. Table 1 details information on the sociodemographic traits of surveyed participants.

Concerning the prevalence of antibiotic use, 19.9% of participants declared that had taken antibiotics in the month of the study, 22.7% during the last six months, 25.1% in the last year, and 24.7% had taken antibiotics more than a year ago. In addition, 38 individuals (7.6%) had never taken antibiotics. We excluded these individuals from further questions in this section. A considerable number of respondents (86.4%) have received a prescription for antibiotics. However, 34.9% of them declared that they refused to take prescribed antibiotics. In addition, 94.0% were advised on how to take antibiotics, but only 87.2% followed these instructions. The prevalence of antibiotics use is presented in Table 2.

It was observed that during the last month, the prevalence of antibiotics used was slightly higher in females (21.9%) than in males (20.9%) ($p$=0.825). The highest prevalence was observed among middle-aged individuals (35-64 years) with 30%, and the lowest among young adults (18-34 years) (15.9%) ($p$=0.048). Also, individuals who lived in urban areas recorded a higher consumption of antibiotics (25.4%) compared to those who lived in rural areas (15.5%) (p=0.908). Concerning the education level, low-educated individuals recorded a considerably higher consumption of antibiotics used during the last month compared to highly educated individuals (40% vs 14.2%; $p$=0.888). Finally, the prevalence of antibiotics used during the last month was higher in respondents who declared middle income (31.6%) compared to those who declared low or high income (5.9% and 4.1%) ($p$=0.890). Regarding the data during the last six months, the prevalence of antibiotics used was considerably higher in females than in males (30.9% vs. 15.1%) ($p$=0.488). Also, the highest prevalence was observed among older people (≥65 years) with 38.8% ($p$=0.298). Respondents from urban areas reported a higher frequency of antibiotics used compared to urban residents (29.7% vs. 16.6%; $p$=0.627). In addition, individuals who received a high school diploma indicated the highest prevalence of antibiotics consumption (42.5%), while the lowest was among highly educated individuals (9.9%). Lastly, during the last six months the frequency of the antibiotics used by respondents who declared middle income was higher (30.4%) compared to those with low (11.8%) or high income (25%) ($p$=0.310). The data from the last year showed that the frequency of antibiotics used was significantly higher in females than in males (30.2% vs. 22.5%) ($p$=0.001). The highest prevalence of antibiotics used was observed among middle aged (31.8%), while the lowest was among young adults (25.9%) ($p$=0.047). Furthermore, the prevalence was the highest among respondents with low education (40%) and the lowest among those who possessed a university degree (21.6%) ($p$=0.001). Also, individuals who declared low income presented a significantly higher prevalence of antibiotics used (37.8%) compared to those who declared middle or high income ($p$=0.012). Respondents who lived in urban areas reported slightly higher but non-significant consumption of antibiotics (27.9%) than rural residents (26%) ($p$=0.326). Table 3 shows the distribution of socio-demographic traits by antibiotics use.

Table 4 demonstrates that young respondents were more likely to self-medicate with antibiotics than respondents in the older people, although this correlation was not statistically significant ($p$=0.608). Also, the frequency of using antibiotics without prescription was non-significantly higher in males ($p$=0.842), low educated individuals ($p$=0.398) and respondents who declared low income (0.459). The residence category appeared to be the only significant characteristic linked with self-medication with

**Table 1:** Socio-demographic traits of participants.

| Variable | Number | Percentage (%) |
|---|---|---|
| **Gender** | | |
| Male | 204 | 40.6 |
| Female | 298 | 59.4 |
| **Age group** | | |
| 18-34 | 251 | 50 |
| 35-64 | 140 | 27.9 |
| ≥65 | 111 | 22.1 |
| **Settlement category** | | |
| Urban | 292 | 58.2 |
| Rural | 210 | 41.8 |
| **Education** | | |
| Primary school (1-9 classes) | 30 | 6 |
| High School | 140 | 27.9 |
| University student | 116 | 23.1 |
| University graduate (Bachelor/Master/ Doctorate) | 216 | 43 |
| **Income** | | |
| Low | 130 | 25.9 |
| Middle | 274 | 54.6 |
| High | 98 | 19.5 |

**Table 2:** Prevalence of Antibiotics use.

| Variable | Frequency | Percentage (%) |
|---|---|---|
| **Recent use of antibiotics** | | |
| During the last month | 100 | 19.9 |
| During the last 6 months | 114 | 22.7 |
| Last year | 126 | 25.1 |
| More than 1 year ago | 124 | 24.7 |
| Never | 38 | 7.6 |
| **Received prescription** | | |
| Yes | 401 | 86.4 |
| No | 63 | 13.6 |
| **Refused to take prescribed antibiotics** | | |
| Yes | 140 | 34.9 |
| No | 261 | 65.1 |
| **Advised on how to use prescribed/non prescribed antibiotics** | | |
| Yes | 436 | 94 |
| No | 28 | 6 |
| **Followed instructions of prescribed/non prescribed antibiotics** | | |
| Yes | 380 | 87.2 |
| No | 56 | 12.8 |

**Table 4:** Distribution of socio-demographic variables by antibiotics prescription.

| Variable | N | Antibiotics Prescription | | |
|---|---|---|---|---|
| | | Yes | No | *p*-value |
| **Gender** | | | | |
| **Male** | 186 | 160(86%) | 26(14%) | 0.842 |
| **Female** | 278 | 241(86.7%) | 37(13.3%) | |
| **Age** | | | | |
| 18-34 | 251 | 206(82.1%) | 45(17.9%) | 0.608 |
| 35-64 | 110 | 96(87.3%) | 14(12.7%) | |
| ≥65 | 103 | 99(96.1%) | 4(3.9%) | |
| **Settlement category** | | | | |
| Urban | 283 | 242(85.5%) | 41(14.5%) | 0.020 |
| Rural | 181 | 159(87.8%) | 22(12.2%) | |
| **Education** | | | | |
| Primary school | 30 | 19(63.3%) | 11(36.7%) | 0.398 |
| High school | 120 | 100(83.3%) | 20(16.7%) | |
| Student | 111 | 96(86.5%) | 15(13.5%) | |
| University degree | 203 | 186(91.6%) | 17(8.4%) | |
| **Income** | | | | |
| Low | 119 | 83(69.7) | 36(30.3) | 0.459 |
| Middle | 253 | 230(90.9%) | 23(9.1%) | |
| High | 92 | 88(95.7%) | 4(4.3%) | |

**Table 3:** Distribution of socio-demographic traits by antibiotics use.

| Variable | N | Use of antibiotics | | | | | |
|---|---|---|---|---|---|---|---|
| | | Last month N=100 | *p*-value | Last six months N=114 | *p*-value | Last Year N=126 | *p*-value |
| **Gender** | | | | | | | |
| Male | 186 | 39(20.9%) | 0.825 | 28(15.1%) | 0.488 | 42(22.5%) | 0.001 |
| Female | 278 | 61(21.9%) | | 86(30.9%) | | 84(30.2%) | |
| **Age group** | | | | | | | |
| 18-34 | 251 | 40(15.9%) | 0.048 | 68(27.1%) | 0.298 | 65(25.9%) | 0.047 |
| 35-64 | 110 | 33(30%) | | 6(23.6%) | | 34(31.8%) | |
| ≥65 | 103 | 27(26.2%) | | 40(38.8%) | | 27(26.2%) | |
| **Settlement** | | | | | | | |
| Urban | 283 | 72(25.4%) | 0.908 | 84(29.7%) | 0.627 | 79(27.9%) | 0.326 |
| Rural | 181 | 28(15.5%) | | 30(16.6%) | | 47(26%) | |
| **Education** | | | | | | | |
| Primary | 30 | 12(40%) | 0.888 | 6(20%) | 0.099 | 12(40%) | 0.001 |
| High school | 120 | 24(20%) | | 51(42.5%) | | 41(34.1%) | |
| Student | 111 | 35(31.5%) | | 37(33.3%) | | 29(26.1%) | |
| University degree | 203 | 29(14.2%) | | 20(9.9%) | | 44(21.6%) | |
| **Income** | | | | | | | |
| Low | 119 | 7(5.9%) | 0.890 | 14(11.8%) | 0.310 | 45(37.8%) | 0.012 |
| Middle | 253 | 80(31.6%) | | 77(30.4%) | | 57(22.5%) | |
| High | 92 | 13(14.1%) | | 23(25%) | | 24(26.1%) | |

antibiotics, indicating that respondents who live in an urban area are more likely to self-medicate (14.5%) with antibiotics compared to those who live in a rural area (12.2%) ($p$=0.020).

The respondents' knowledge about antibiotic resistance was evaluated through their responses to eight statements. The results showed that 81.1% of the respondents had a false belief that antibiotic resistance happens when the body is resistant to antibiotics. A considerable number of surveyed individuals (42.8%) believed that antibiotic resistance is only a problem for those who take antibiotics often, while 59.4% were unaware that antibiotic-resistant bacteria can spread from one person to another. The summarized information about knowledge questions is presented in Figure 1.

After calculating the total scores for everyone, the assessment of the knowledge level indicated that 35.9% of the total respondents had a good knowledge of antibiotic resistance scoring 75% and above. Overall, females had a higher level of knowledge than males (36.9% vs 34.3%; $p$=0.005). The knowledge level was also significantly linked with education ($p$=0.018) indicating that 40.7% of highly educated individuals had a good knowledge level scoring 75% or higher, while only 20% of low educated individuals scored≥75%. In addition, 39.4% of young adults showed a good knowledge level compared to middle aged (27.9%) and older people (37.8%) ($p$<0.001). Although urban residents had a higher knowledge score (41.1%) compared to rural residents (28.6%), this association was not significant ($p$=0.131). The distribution of respondents' knowledge scores is shown in Table 5.

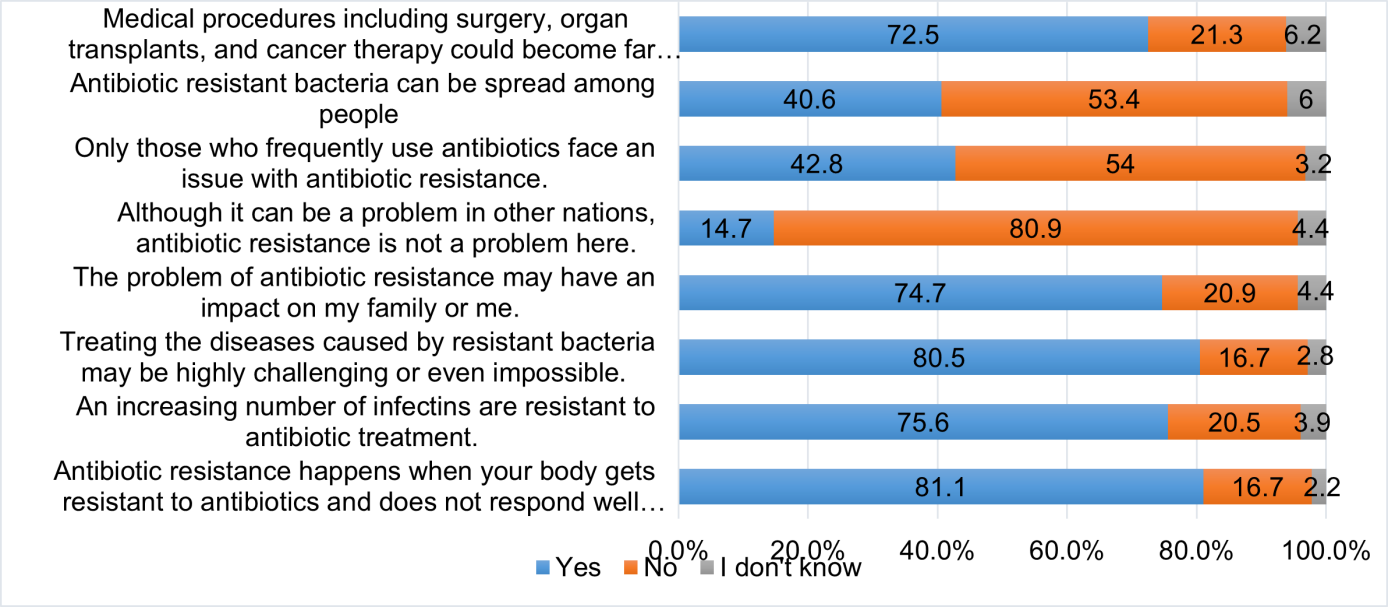


**Figure 1:** Overview of responses to knowledge questions.

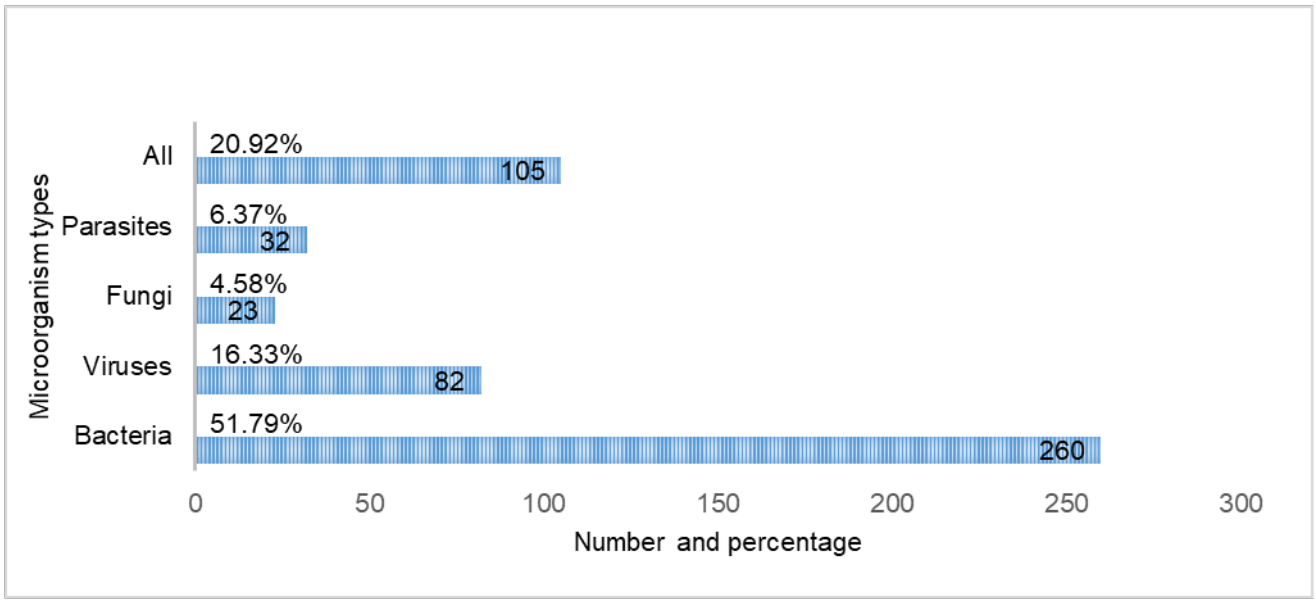


**Figure 2:** Respondents' opinion about micro-organisms that antibiotics can fight.

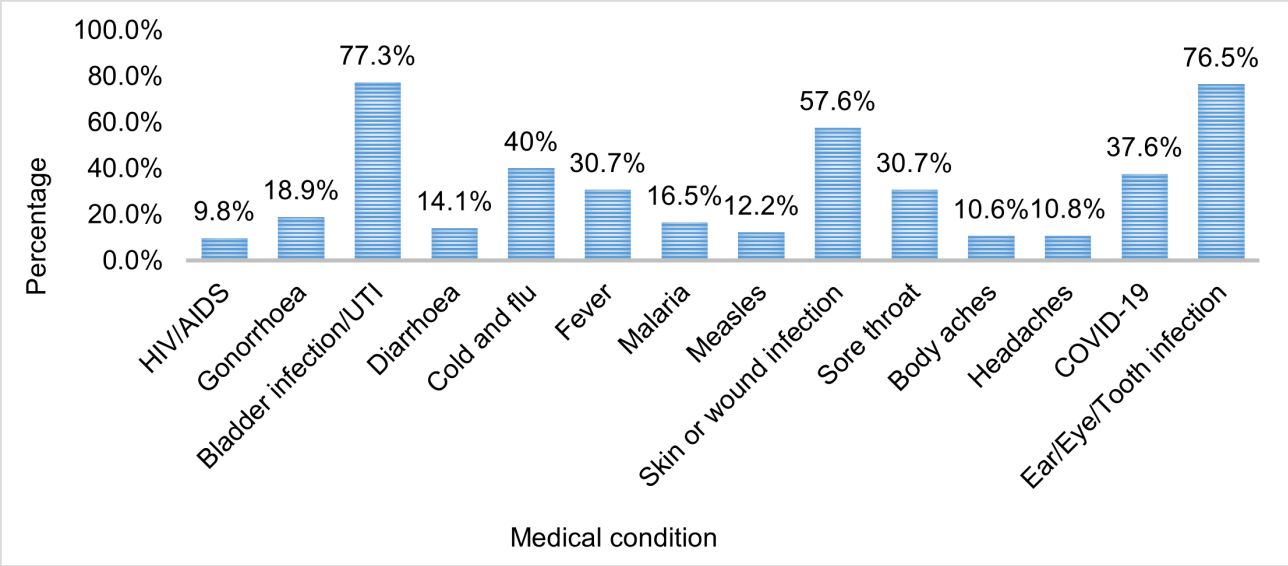


**Figure 3:** Respondents' opinions about the conditions that antibiotics can fight.

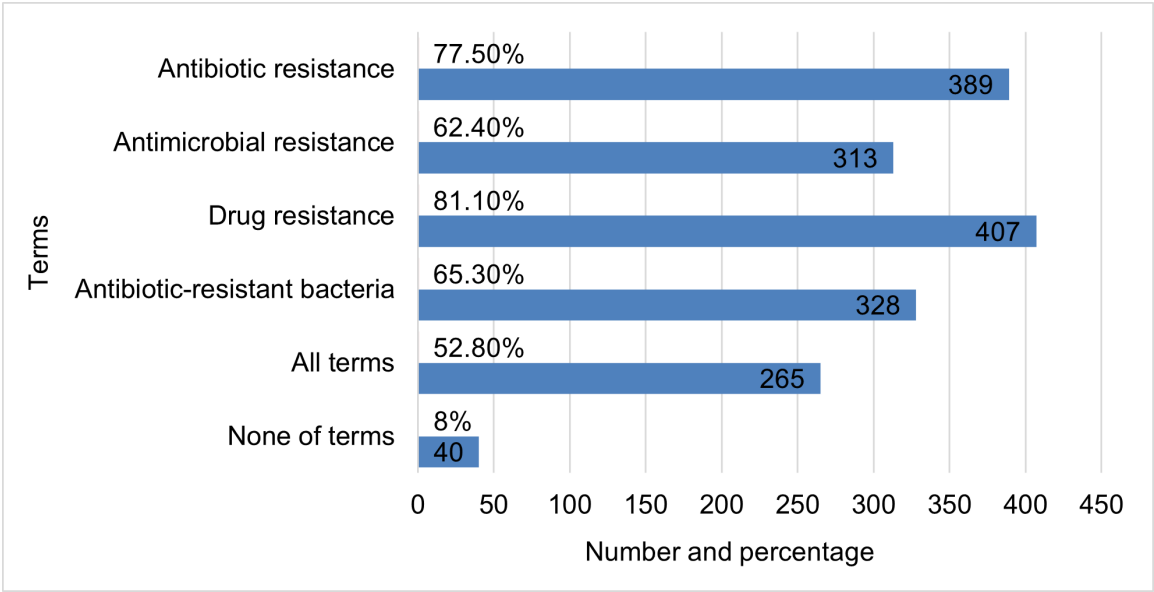


**Figure 4:** Familiarity of respondents with terms used to describe drug resistance.

Figure 2 presents respondents' opinion to the single choice question about the microorganisms that antibiotics can fight. Only 51.79% correctly picked bacteria as the type of microorganisms treatable with antibiotics. Furthermore, 16.33% of the respondents stated that antibiotics work against viruses, while 20.92% think that antibiotics fight all micro-organisms including yeast and parasites.

When the respondents were asked about the most common conditions treatable by antibiotics most of them picked different infections such as: bladder infections (77.3%), ear/eyes/tooth infections (76.5%), and skin/wound infections (57.6%). However, only 18.9% of respondents identified gonorrhea as a disease that can be treated by antibiotics. Nonetheless, 40% of individuals wrongly picked common colds and flu as conditions treated with antibiotics. In addition, 37.6% of participants stated that COVID 19 should be treated with antibiotics. Also, 30.7% of the respondents considered appropriate using antibiotics for conditions like fever and sore throat. Figure 3 shows respondents' opinions about the conditions that can be treated with antibiotics.

In another multiple-choice question, the surveyed individuals were asked to choose among the drug resistance terms, the ones they were familiar with. The most familiar terms were "drug resistance" (81.1%) and "antibiotic resistance" (77.5%). In addition, more than half of individuals (52.8%) had heard about all the terms, while 8% of them were not aware of any of the terms Figure 4.

Perception and attitude toward antibiotics resistance were answered as shown in Figure 5 and summarized below:

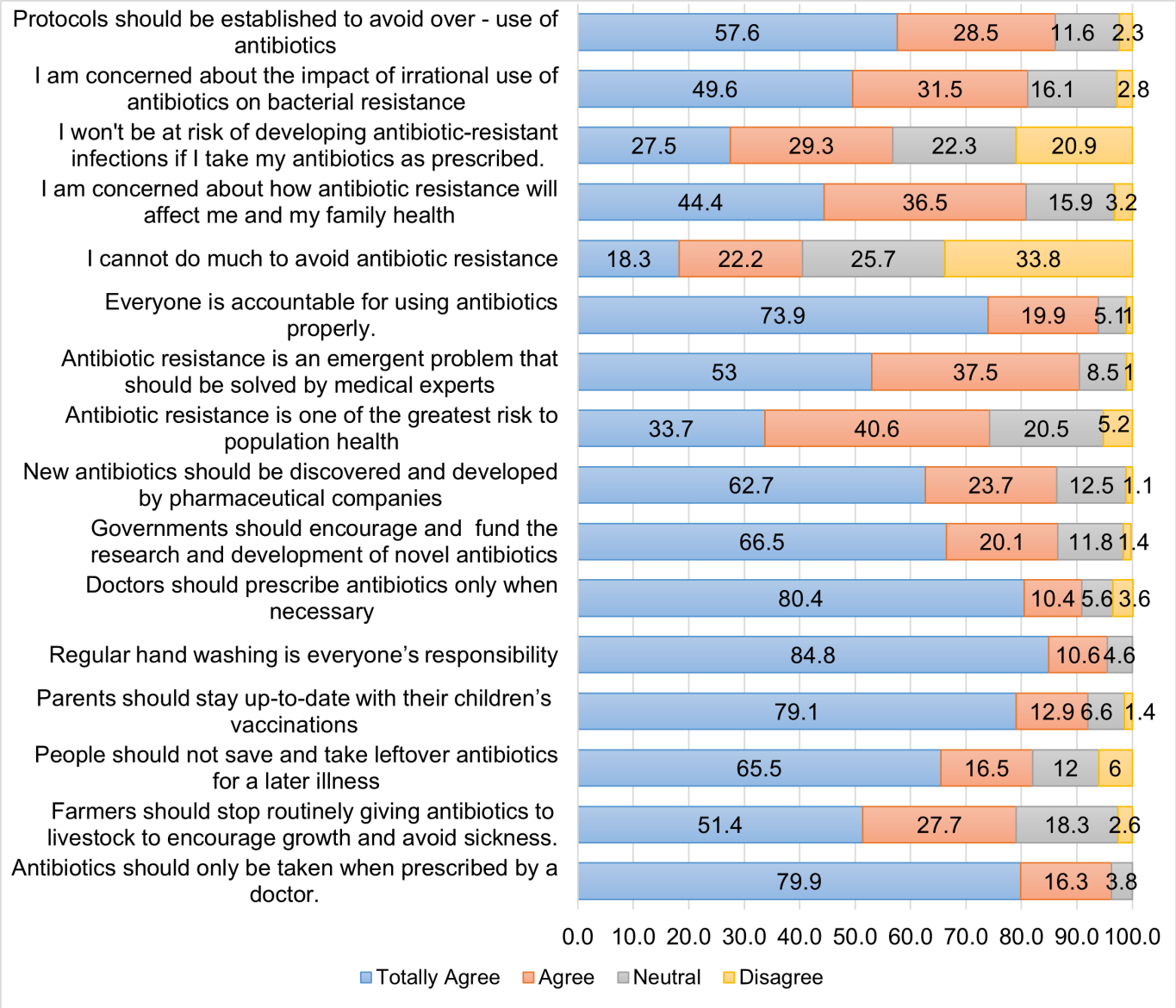


**Figure 5:** Respondents' attitude toward antibiotic resistance.

Although 81.1% (407) of the respondents expressed concern about the effect of irrational antibiotic usage on bacterial resistance, 40.5% (203) agreed that they cannot do much to prevent antibiotic resistance. Furthermore, 56.8% (285) believed that if they use antibiotics as prescribed, they won't develop infections that are resistant to them. Most of the respondents considered it a problem that should be addressed by medical professionals through prescribing antibiotics only when required 90.8% (456), by government through funding the research and development of new antibiotics 86.6% (435) and pharmaceutical manufacturers through developing novel antibiotics (86.4%).

## DISCUSSION

In our study the age group was significantly associated with the prevalence of antibiotics used during the last month ($p$=0.048) and last year ($p$=0.047) indicating that middle and third-aged individuals had a higher frequency of antibiotic consumption compared to young adults. With respect to gender, female respondents had a higher frequency of antibiotics used in the previous year in comparison to male respondents (30.2% vs 22.5%; $p$=0.001). There is a lot of evidence showing that antibiotic consumption rates differ considerably in accordance with age, sex, and education level. A study conducted in 2016 in Campania, Southern Italy, found that women between the ages of 17 and 77 had higher prescription rates for antibiotics.[17] Another study conducted in Spain explained that higher rates of antibiotic prescriptions in females among 15-65 years were associated to the number of medical visits.[18]

Self-medication plays an essential part in increasing antibiotic use and development of antibiotic resistance.[19,20] The phenomenon of obtaining antibiotics without a prescription is still present among the capital population of Albania regardless of the law against it.

**Table 5: Knowledge scores distribution by socio-demographic variables.**

| Variable | Knowledge score | | | | Chi-squared ($X^2$) | *p*-value |
|---|---|---|---|---|---|---|
| | N | Poor (%) ≤25% | Sufficient (%) 25%-75% | Good (%) ≥75% | | |
| **Gender** | | | | | | |
| Male | 204 | 15(7.4) | 119(58.3) | 70(34.3) | 20.305 | 0.005 |
| Female | 298 | 8(2.7) | 180(60.4) | 110(36.9) | | |
| Total | 502 | 23(4.6) | 299(59.6) | 180(35.9) | | |
| **Age Group** | | | | | | |
| 18-34 | 251 | 13 (5.2) | 139 (55.4) | 99 (39.4) | 95.733 | <0.001 |
| 35-54 | 140 | 6 (4.3) | 95 (67.9) | 39 (27.8) | | |
| ≥65 | 111 | 4 (3.6) | 65 (58.6) | 42 (37.8) | | |
| **Settlement** | | | | | | |
| Urban | 292 | 8(2.7) | 164(56.2) | 120(41.1) | 11.173 | 0.131 |
| Rural | 210 | 15(7.1) | 135(64.3) | 60(28.6) | | |
| **Education** | | | | | | |
| Primary School | 30 | 10(33.3) | 14(46.7) | 6(20) | 54.749 | 0.018 |
| High School | 140 | 8(5.7) | 82(58.6) | 50(35.7) | | |
| Student | 116 | 4(3.4) | 76(65.5) | 36(31) | | |
| University Degree | 216 | 1(0.5) | 127(58.8) | 88(40.7) | | |
| **Income** | | | | | | |
| Low | 130 | 12(9.2) | 51(39.2) | 67(51.5) | 13.288 | 0.898 |
| Middle | 274 | 10(3.6) | 198(72.3) | 66(24.1) | | |
| High | 98 | 1(1) | 50(51) | 47(48) | | |

Among the surveyed individuals, 13.6% have used antibiotics without a prescription. Self-medication with antibiotics is common in both industrialized and developing nations, with prevalence rates ranging from 3 to 75%.[21] It differs among European countries. For instance, studies have shown that self-medication is less prevalent in Denmark at 3%,[22] in the United Kingdom and Spain at 5% and 11% respectively,[23,24] compared to Malta and Lithuania at 19% and 22%, respectively[25,26] Our findings showed that self-medication with antibiotics were more present among young participants compared to older people ($p$=0.608). A study comparing the incidence of self-medication with antimicrobials over a year in 19 European nations revealed a higher likelihood of self-medication with these medications in younger age groups.[19] In terms of educational level, our findings indicated that low-educated individuals were more likely to self-medicate with antibiotics compared to high educated ones ($p$=0.398). The results of a similar study showed that adults with low and medium levels of education had a higher frequency of using antibiotics without prescription.[27] We also found that individuals who perceived themselves in good economic status were less prone to self-medicate with antibiotics ($p$=0.459). A study conducted in Italy indicated similar results.[28] Unlike previous studies, the only significant factor associated to self-medication found in our research was type of residence. Self-medication is more common among urban residents than rural residents ($p$=0.020). Despite non-significant associations, our findings highlight the necessity to define the target population categories and strengthen the information about antibiotic resistance among them through campaigns as well as through enhancing the role of the family doctor and pharmacists.

Although more than half of our respondents (51.8%) correctly identified bacteria as antibiotic-fighting micro-organisms, there was a certain degree of misconception about the indications of antibiotics. For instance, 16.3% of the respondents believed that antibiotics work against viruses, and 20.9% agreed that antibiotics are effective against any type of microorganisms. Also, a considerable number of respondents selected viral infections such as cold and flu (40.0%), COVID19 (37.6%), fever (30.7%), and sore throat (30.7%) as indications for antibiotic use. In addition, only 18.9% of respondents selected gonorrhea as a disease that can be treated by antibiotics. A study conducted in 2014 in Albania indicated that among young adults, the most common causes of self-medication with antibiotics were fever (29.23%), sore throat (29.06%) and cough (14.19%).[29] A cross-sectional survey in China during 2019 revealed that 72.4% of participants agreed that antibiotics are used to treat viral infections.[30]

However, our results indicate that individuals are still confused regarding the conditions that can be treated with antibiotics. This highlights the need of healthcare professionals clearly defining the distinction between viral and bacterial infections for patients. Overall, 39.8% of the respondents showed a good knowledge of antibiotic resistance. A significant association was observed between knowledge and gender ($p$=0.005) indicating that females had a higher level of knowledge than males. In addition, knowledge level was significantly related with education ($p$=0.018) and age ($p$<0.001) showing that highly educated individuals and young adults (18-34 years) scored higher than the other groups. In terms of terminology knowledge, 37.6% of the respondents had never heard of antibiotic resistance. Despite having some knowledge of antibiotic resistance, respondents do not fully comprehend it. More than half of the surveyed individuals (56.8%) agreed that if they take their antibiotics as prescribed, they are not at danger of developing an infection that is resistant to antibiotics. This is untrue, because resistant bacteria can be spread among individuals. The fact that 40.5% of individuals think they can do nothing to limit the spread of antibiotic resistance is another issue. Everyone plays a crucial part, and community involvement is a successful strategy for reducing the spread of antibiotic resistance.

## CONCLUSION

Due to significant impact that antibiotic resistance has on our lives and the worldwide future health, it is crucial for people to fully comprehend this phenomenon and be aware of how their activities affect antibiotic resistance. The findings of this study may be helpful for several actors of the healthcare system such as healthcare providers, policymakers, and decision-makers to develop efficient strategies for the management and prevention of antibiotic resistance. To summarize, this survey emphasizes the immediate need for an awareness program to expand the knowledge and the problems relating to antibiotic resistance in particular among certain sociodemographic categories where the level of knowledge was significantly low. We recommend further studies to be more geographically extensive, to obtain as much data as possible on the level of awareness of the population on antibiotic resistance.

## ACKNOWLEDGEMENT

Authors would like to acknowledge the efforts of the surveyed individuals who took valuable time to be part of this survey.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## ABBREVIATIONS

**EU:** European Union.

## SUMMARY

The aim of this research was to evaluate the level of knowledge and awareness of the general population about the use and resistance to antibiotics and determine the demographic characteristics associated with them. A validated survey was used for this purpose. The results showed that the level of knowledge was significantly associated with gender (p=0.005), education ($p$=0.018), and age ($p$<0.001), while the settlement category appeared to be significantly associated with self-medication ($p$=0.020). Findings of our research can serve as a baseline for further interventions addressing these issues and promoting the proper use of antibiotics.

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