

## Usage and Most Common Prescribed Antibiotics in the Population of 15 Years of Age in the Tuzla Canton of Bosnia And Herzegovina

**Perić Kanita<sup>1</sup>**

<sup>1</sup>*Faculty of Pharmacy, University of Tuzla, Bosnia and Herzegovina*  
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### **ABSTRACT**

The results of the research show that the largest number of respondents from the area of the city of Tuzla, suburbs and rural settlements used antibiotic therapy. Self-initiated use of therapy is present in both observed groups, but a higher percentage was recorded in the group of girls. In the suburbs, this percentage is approximately the same in both groups, in the group of boys and in the group of girls, and is twice as high as in peers from urban areas. In the population from rural settlements, the percentage of self-initiated use of antibiotic therapy is significantly lower than in urban areas. Subjects of all examined groups most often used penicillin (ampicillin, amoxicillin). Respondents who stated that they receive other antibiotics state that the reason is exclusively an allergic reaction to penicillin. Future studies may investigate the use and most commonly used antibiotics in boys and girls in other countries and cultures to get a clear picture of which countries have irrational antibiotic use in younger populations, and the occurrence of allergies at a later age may be related, about which there are some studies.

**KEYWORDS:** age, antibiotic therapy, urban and suburban area.

### **I. INTRODUCTION**

Antibiotics should be used only in cases where it is possible to prove their justification. However, today we encounter the mass use of antibiotics as a result of unjustified prescribing by doctors and self-initiated use by patients. Doctors should have the greatest responsibility for the effectiveness of antibiotics, because they prescribe about 80% of the total prescribed antibiotics. Antibiotics are most often prescribed for acute respiratory and urinary tract infections. Acute infections of the upper respiratory system are the most common inflammation of today and make up 2/3 of all infections. An adult gets sick on average 3-5 times a year, and children even a dozen times. Medical error results from prescribing antibiotic therapy without an etiological diagnosis, so, for febrile conditions that do not have a bacterial cause, antibiotics are prescribed, such as viral infections, and antibiotics have no effect on viruses. So antibiotics should be prescribed only if infections caused by bacteria are suspected, which is quite rare. The best way to determine is to make an etiological diagnosis, which is rarely done in the area of Tuzla canton. The symptoms of a viral infection are quite similar to a bacterial one. The best evidence that it is a bacterial infection is the duration of the symptoms. A stuffy nose, cough and sore throat with a bacterial infection last for more than 10 days and there is no visible improvement. Viral and bacterial inflammation often go away without antibiotic treatment, but a doctor can prescribe it at his or her own judgment [1].

Often patients take antibiotics on their own initiative, especially when they experience similar symptoms as in cases when their doctor prescribed antibiotic therapy. Also, patients often do not follow the doctor's instructions on the amount of dose and duration of therapy and stop therapy as soon as the first signs of improvement appear. All this leads to harm to the patient and society, because improper use of antibiotics results in the emergence of resistance, suprainfections and high treatment costs.

Namely, there is a cause-and-effect relationship between the use of beta-lactam antibiotics and the development of resistance of *S.pneumoniae* to penicillins. The resistance of this bacterium is doubled in children if they have been treated with these antibiotics in the last two months before taking the swab [2].

Doctors have found that multiple groups of antibiotics increase the risk of allergies, and that it is greatest in those in the penicillin group. If a child takes an antibiotic in the first year, he has a 20 percent higher risk of developing asthma, just like if he was born by caesarean section. Microbiologist Brett Finaly says rural life and breastfeeding reduce the risk of developing asthma by 20 percent. He led a study that back in 2015 found that four types of bacteria in a child's gut can reduce the risk of developing asthma. Allergic protection

begins in the mother's womb, and in the first 100 days of life, the intestinal microbiome affects the immune response that causes or protects against asthma. Which side will prevail depends largely on how we promote a healthy intestinal flora. A Finnish study published in the journal *The Lancet* found that the incidence of atopic dermatitis was 50 percent lower in children whose mothers took the probiotic *Lactobacillus Rhamnosus* during pregnancy. The protective effect was also visible seven years after birth [3]. U.S. physicians and the study's author, pediatric gastroenterologist at the Uniformed Services University in Maryland, Dr. Cade Nyland, found that there was a higher risk in later childhood of food allergies, asthma, or skin dermatitis in babies receiving penicillin [4].

## **II. EXAMINEES AND METHOD**

### **2.1 Sample of respondents**

The sample of examinees for this research consists of a group of boys and girls, primary and secondary school students from the Tuzla Canton at the age of 15. The sample was collected from January 1, 2018 to May 30, 2019. It consists of a total of 1605 respondents, of which 574 respondents are from rural areas (226 boys and 348 girls), 665 respondents from urban schools (357 boys and 308 girls) and 366 respondents from suburban schools (116 boys and 250 girls). The sample of respondents was divided into two groups:

1. Experimental group: boys aged 15 years from the Tuzla Canton.
2. Control group: 15-year-old girls from the Tuzla Canton.

### **2.2. Data collection method**

Subjects were selected by random sampling. The research was conducted voluntarily. The questionnaire was submitted to schools with the previously obtained consent of the Ministry of Education and Science of Tuzla Canton (Number: 10 / 1-38-3462 / 19), and for the accuracy of the data, it was filled out by the parents or guardians of the examinees. The age of the respondents is from 14.6 to 15.5 years. The survey questionnaire consisted of several questions, such as: the exact age of the respondents, whether the antibiotic was ever used in therapy, what type of antibiotic was most often used, the length of therapy, whether there are allergies to antibiotics and which, whether antibiotics are used only with a doctor's recommendation, do they follow the instructions for use, especially when it comes to regular use and duration of therapy, do they always feel better after antibiotic therapy and what is the most common type of prescribed therapy - topical, per os or parenteral.

### **2.3. Data processing method**

After data collection, the division into gender categories and data collection area was performed, and then for each sex certain age categories and settlements were calculated basic statistical parameters and statistical significance ( $\chi^2$ -test hi-square), between the compared categories of respondents. All data were processed in Microsoft Office Excel 2013 and SPSS 21 statistics, and presented in Microsoft Office Word 2013. The first part of statistical data processing consisted of analysis of the sample by groups, which are expressed in the form of tables and graphs. Testing of the selected data was performed by chi-square test. Significance of the association was determined by chi-square test at a significance level of 0.05. The null hypothesis can be accepted if the value of  $p > 0.05$ , ie. there is no statistically significant correlation between the tested data. Measurements were performed with a contingency coefficient (phi-coefficient) and a Cramer coefficient at the significance level of 0.05. The correlation was measured by the Pearson correlation coefficient, at the significance level of 0.05. In the end, all the obtained results are presented in tables and graphs.

## **III. RESULTS**

The results of the analysis of the prevalence of antibiotic therapies in the population of 15 years in Tuzla Canton, on a sample of 1605 respondents, of which 665 respondents from urban areas (308 girls and 357 boys), 366 respondents in the suburbs (250 girls and 116 boys) and 574 respondents from rural areas (226 boys and 348 girls) provide insight into the scope of application and the most common advice of antibiotic therapy in the Tuzla Canton.

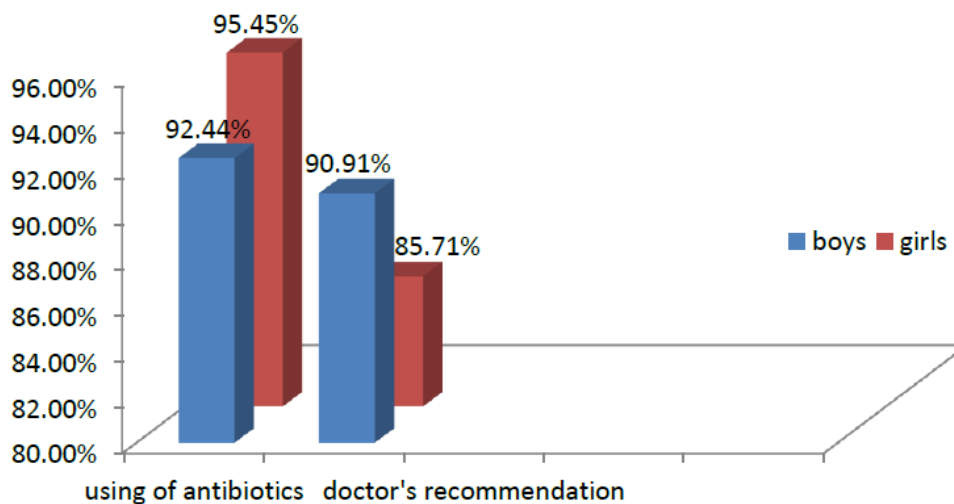
In the first part of the research, the extent of antibiotic use in the population of boys and girls aged 15 from the city of Tuzla, then suburban and rural settlements, and then examined the extent of antibiotic therapy in the total sample of respondents from Tuzla Canton.

Tables 1 and 2 and Charts 1 and 2 show the use of antibiotics in the population of boys and girls aged 15 years in urban and suburban areas. The results show that the largest number of respondents in urban areas (boys 92.44% and girls 95.45%) and suburban areas (boys 100% and girls 100%), used antibiotic therapy.

*Usage And Most Common Prescribed Antibiotics In The Population Of 15 Years Of Age ..*

**Table 1.** Usage of antibiotics in the population of 15 years in the city of Tuzla

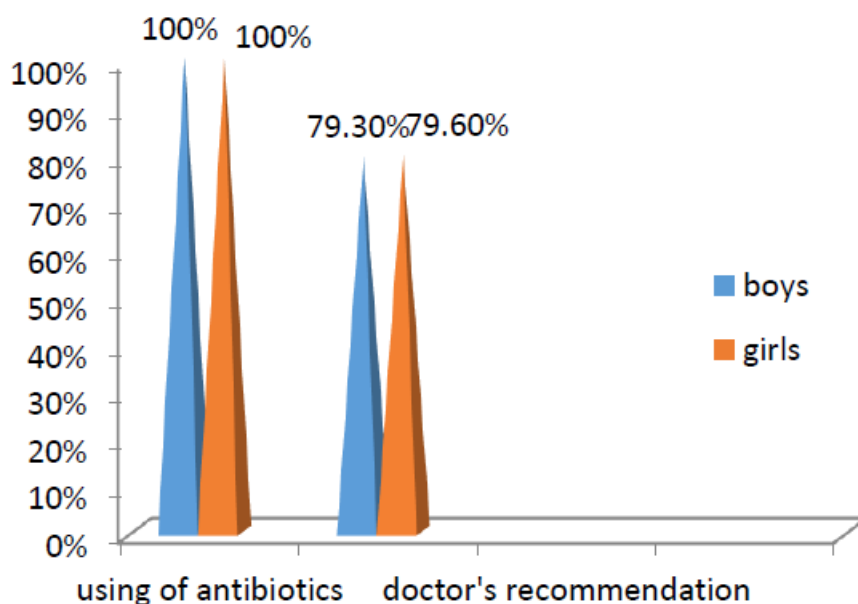
Age 15 years		Antibiotics were used		Use as recommended by your doctor	
		yes	no	yes	no
Boys	357	330 (92,44%)	27 (7,56%)	300 (90,91%)	30 (9,09%)
Girls	308	294 (95,45%)	14 (4,55%)	252 (85,71%)	42 (14,29%)
<b>Total</b>	<b>665</b>	<b>624 (93,83%)</b>	<b>41 (6,17%)</b>	<b>552 (88,5%)</b>	<b>72 (11,5%)</b>



**Figure 1.** Usage of antibiotics in the population of 15 years from the area of the city Tuzl

**Table 2.** Usage of antibiotics in the 15-year-old population in the suburbs

Age of 15 years		Antibiotics were used		Use as recommended by your doctor	
		yes	no	yes	no
Boys	116	116 (100%)	-	92 (79,3%)	24 (20,7%)
Girls	250	250 (100%)	-	199 (79,6%)	51 (20,4%)
<b>Total</b>	<b>366</b>	<b>366 (100%)</b>	<b>-</b>	<b>291(79,5%)</b>	<b>75(20,5%)</b>

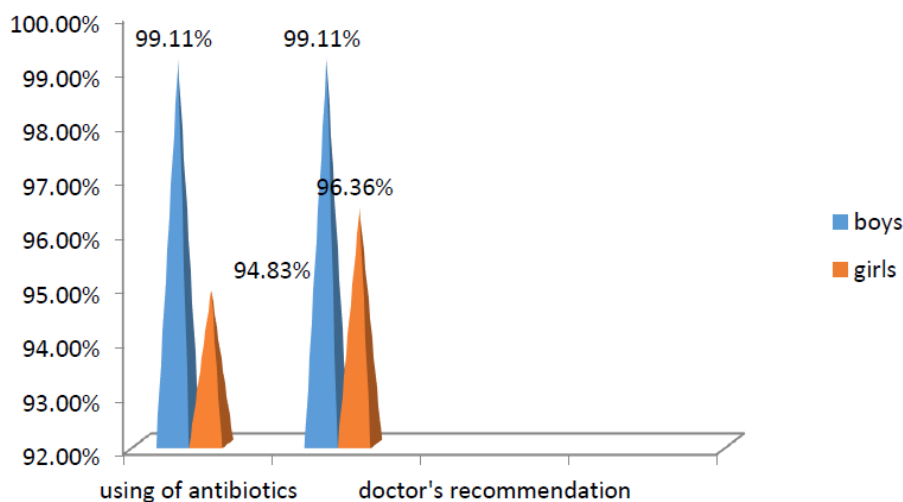


**Figure 2.** Usage of antibiotics in the population of 15 years from a suburban area

Table 3 shows the usage of antibiotics in the population of boys and girls aged 15 from rural area.

**Table 3.** Usage of antibiotics in the population of 15 years from rural area

Age of 8 years		Antibiotics were used		Use as recommended by your doctor	
		yes	no	yes	no
Boys	226	224 (99,11 %)	2 (0,88%)	222 (99,11%)	2 (0,89%)
Girls	348	330 (94,83%)	18 (5,17%)	318 (96,36%)	12 (3,64%)
<b>Total</b>	<b>574</b>	<b>554 (96,5%)</b>	<b>20 (3,5%)</b>	<b>540(92,5%)</b>	<b>14(2,5%)</b>

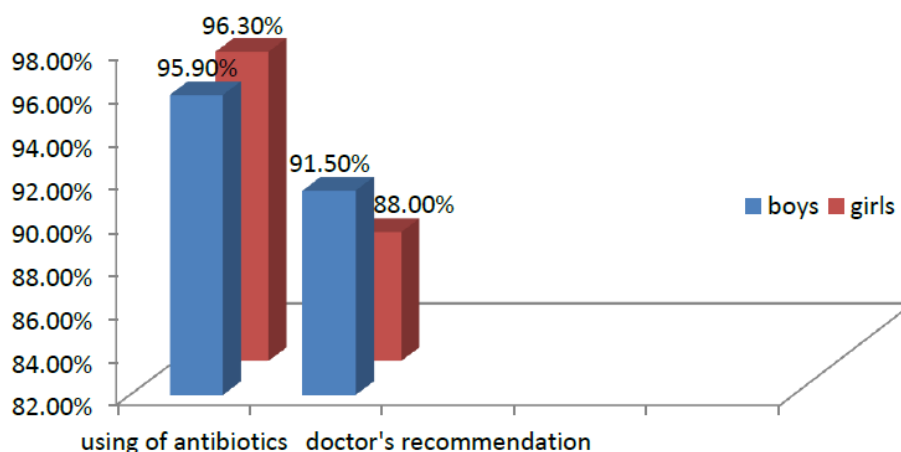


**Figure 3.** Usage of antibiotics in the population of 8 years from the area of the city Tuzla

Table 4 and Chart 4 contain data on the extent of antibiotic use in the total sample of boys and girls aged 15 in Tuzla Canton. The results of the study show that 95.9% of boys and 96.3% of girls, from the examined population, used some kind of antibiotic, ie. only 3.9% of the study population had never used antibiotic therapy. Self-initiated use is higher in percentage in the group of boys than in the group of girls and amounts to 91.5%.

**Table 4.** Usage of antibiotics in the population of 15 years from Tuzla canton

Age of 8 years		Antibiotics were used		Use as recommended by your doctor	
		yes	no	yes	no
Boys	699	670 (95,9 %)	29 (4,1%)	614 (91,5%)	57 (8,5%)
Girls	908	874 (96,3%)	32 (3,7%)	769 (88%)	105 (12%)
<b>Total</b>	<b>1607</b>	<b>1544 (96,1%)</b>	<b>61 (3,9%)</b>	<b>1383(89,6%)</b>	<b>162(10,4%)</b>



**Figure 4.** Usage of antibiotics in the population of 15 years from the Tuzla canton

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Table 5 shows data on differences in antibiotic use between the compared categories and calculated statistically significant differences between the compared groups. Statistically significant differences occur between boys from the city and boys from the village ( $p = 0.003$ ), as well as girls from the city and girls from the village ( $p = 0.035$ ).

**Table 5.** Differences in antibiotic using between the observed groups of examinees

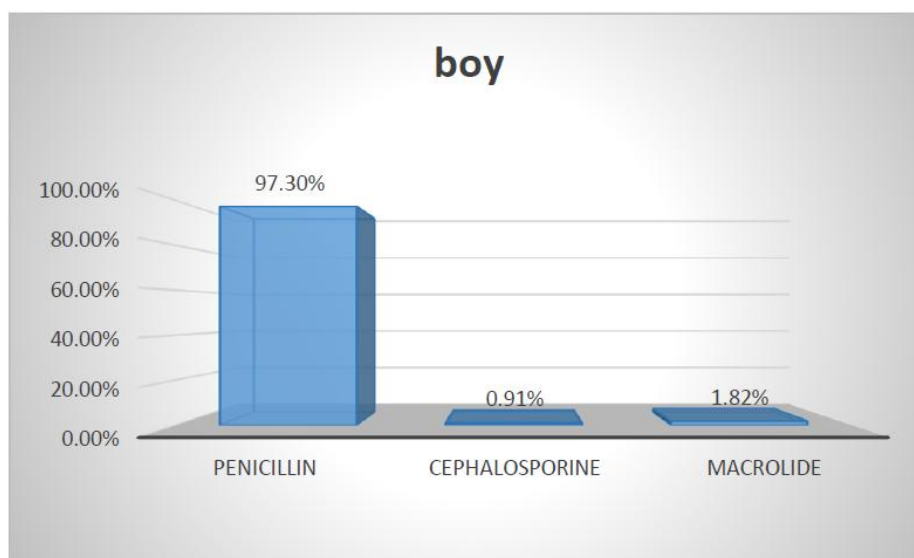
Compared categories	N	df	Phi value	Cramer's value	Contingency coefficient	Pearson Chi-Square	Sig. (p)
All Boys-Girls aged 15 years.	1605	1	0,016	0,016	0,016	0,411	0,522
City-Village	1605	1	0,012	0,012	0,012	0,245	0,621
Boys from the city-Boys from the village	699	1	0,113	0,113	0,112	8,947	0,003
Girls from the city-Girls from the village	906	1	-0,070	0,070	0,070	4,462	0,035

Tables 6,7,8 i 9 and Figures 5-12 contain data on the types of most commonly prescribed antibiotics in Tuzla Canton.

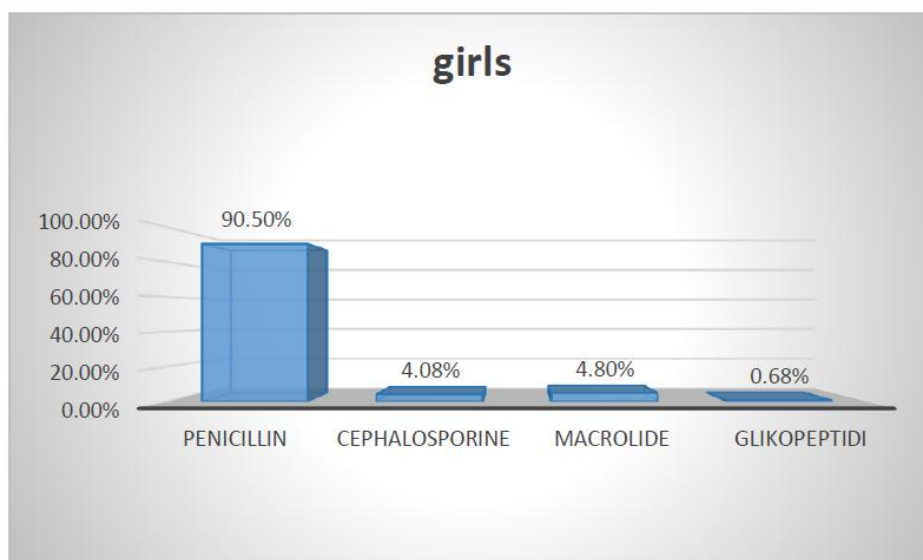
Table 6 contains data on the most commonly used antibiotics in the 15-year-old population in the city of Tuzla. The most commonly used penicillin antibiotics (94.1% of the population), followed by macrolide antibiotics (3.2% of the population).

**Table 6.** The most commonly used antibiotics in the population of 15 years in the city of Tuzla

Antibiotic	Penicillines	Cephalosporines	Macrolides	Sulphonamides	Glycopeptides
Boys	321 (97,3%)	3(0,91%)	6 (1,82%)	-	-
Girls	266 (90,5%)	12 (4,08%)	14 (4,8%)	-	2 (0,68%)
Totale	587 (94,1%)	15 (2,4%)	20 (3,2%)	-	2 (0,32%)



**Figure 5.** Distribution of antibiotics in the population of boys aged 15 years in the city of Tuzla

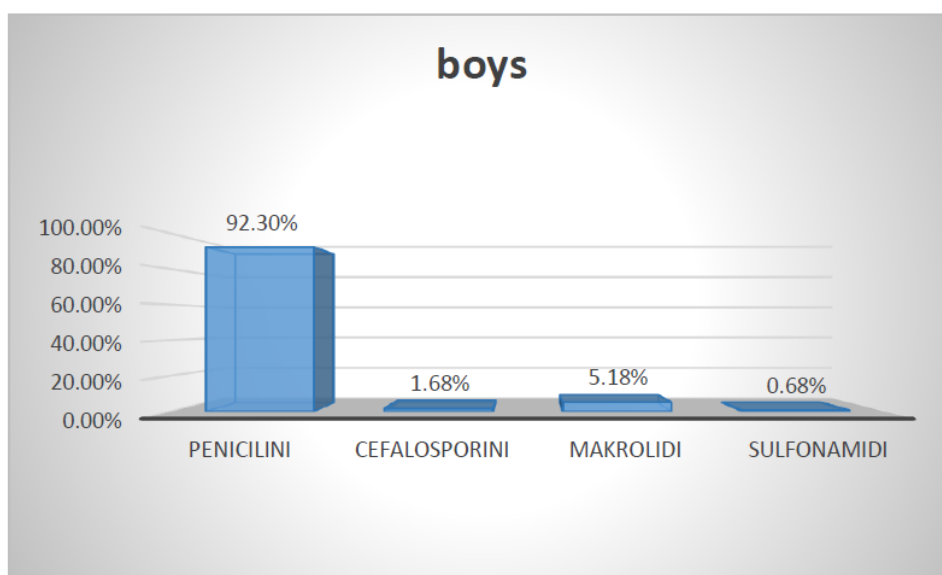


**Figure 6.** Distribution of antibiotics in the population of girls aged 15 years in the city of Tuzla

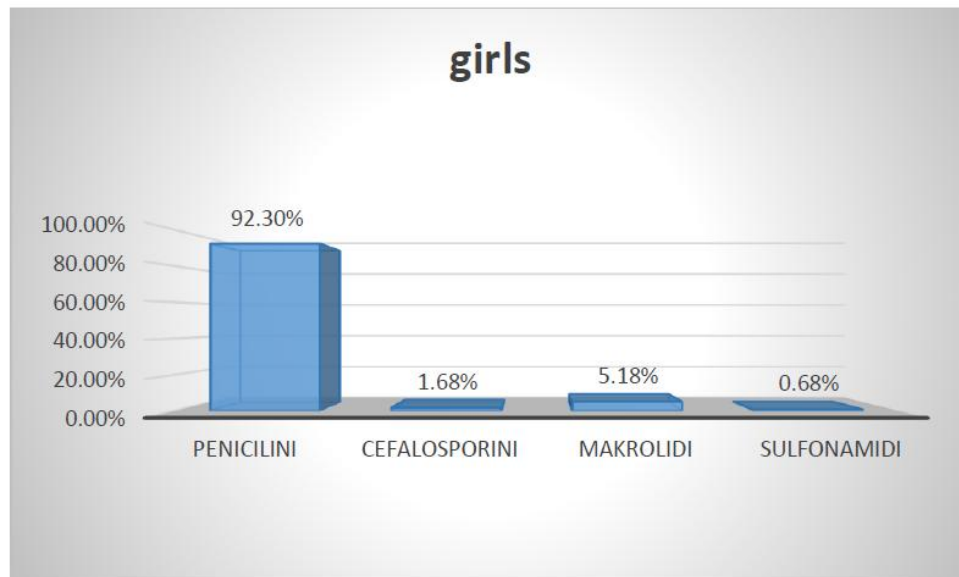
Table 7 shows data on the most commonly used antibiotics in the 15-year-old population from the suburbs. In the suburbs, the largest number of respondents 86.6% used penicillin therapy, and macrolides were used by 12.6% of the population. In the suburban settlement there are no respondents who used cephalosporin therapy.

**Table 7.** The most commonly used antibiotics in the 15-year-old population in suburban areas

Antibiotic	Penicillines	Cephalosporines	Macrolides	Sulphonamides	Lincosamides
Boys	88 (75,9%)	-	28 (24,14%)	-	-
Girls	229 (91,6%)	-	18 (7,2%)	-	3 (1,2%)
<b>Totale</b>	<b>317 (86,6%)</b>	-	<b>46 (12,6%)</b>	-	<b>3 (0,82%)</b>



**Figure 7.** Distribution of antibiotics in the population of boys aged 15 years in the suburbs of Tuzla

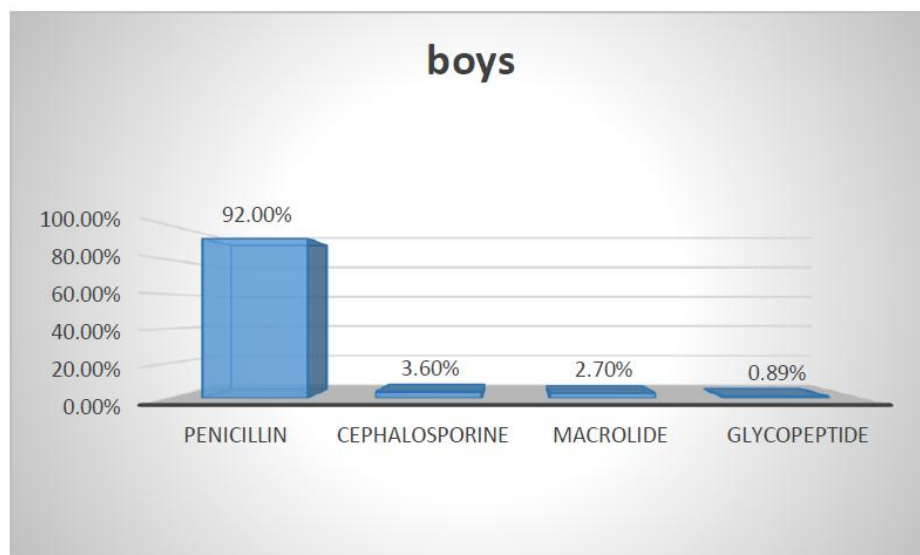


**Figure 8.** Distribution of antibiotics in the population of girls aged 15 years in the suburbs of Tuzla

Table 8 shows data on the most commonly used antibiotics in the 15-year-old population from rural settlements. And in the rural settlement, the largest number of respondents 94.4% used penicillin therapy. 2.2% used macrolide therapy, 2% cephalosporin, 1.09% sulfonamides, and 0.36% glycopeptide.

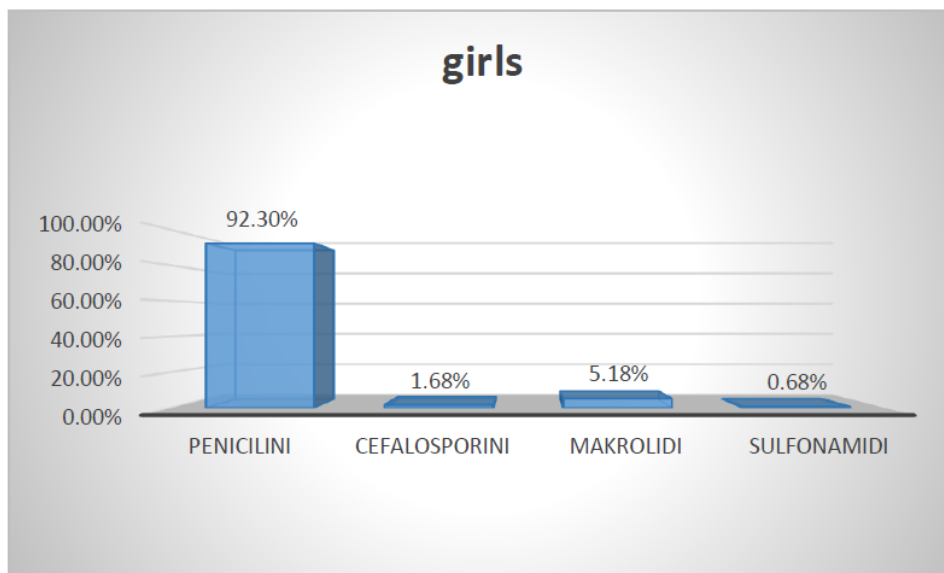
**Table 8.** The most commonly used antibiotics in the population aged 15 years from rural areas

Antibiotic	Penicillines	Cephalosporines	Macrolides	Sulphonamides	Glycopeptides
Boys	206 (92%)	8 (3,6%)	6 (2,7%)	-	2 (0,89%)
Girls	315 (95,5%)	3 (0,91%)	6 (1,82%)	6 (1,82%)	-
<b>Totale</b>	<b>521 (94,4%)</b>	<b>11 (2%)</b>	<b>12 (2,2%)</b>	<b>6 (1,09%)</b>	<b>2 (0,36%)</b>



**Figure 9.** Distribution of antibiotics in the population of boys aged 15 years from the rural areas



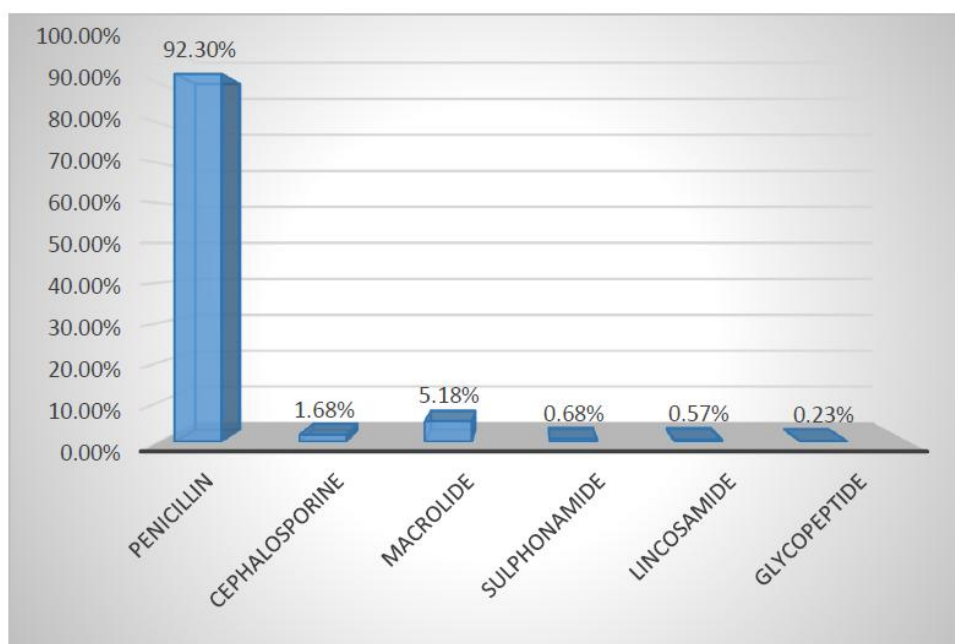


**Figure 10.** Distribution of antibiotics in the population of girls aged 15 years from rural areas

Table 9 shows data on the most commonly used antibiotics in the total sample of boys and girls aged 15 years in the Tuzla Canton. Penicillin were used as therapy by 92.3%, macrolides 5.18%, cephalosporin 1.68%, sulfonamide 0.68%, lincosamide 0.57% and glycopeptide 0.23% of the study population

**Table 9.** The most commonly used antibiotics in the population aged 15 years from Tuzla canton

Age of 15 years	Antibiotics					
	Penicillin	Cephalosporine	Macrolide	Sulphonamide	Lincosamide	Glycopeptide
Boys	615 (92%)	11 (1,64%)	42 (6,3%)	-	-	2 (0,29%)
Girls	810 (92,6%)	15 (1,71%)	38 (4,34%)	6 (0,68%)	5 (0,57%)	-
<b>Totale</b>	<b>1425</b> <b>(92,3%)</b>	<b>26</b> <b>(1,68%)</b>	<b>80</b> <b>(5,18%)</b>	<b>6</b> <b>(0,68%)</b>	<b>5</b> <b>(0,57%)</b>	<b>2</b> <b>(0,23%)</b>



**Figure 11.** The most frequently used antibiotics in the total sample of 15-year-old respondents from Tuzla Canton



Table 10 shows data on a statistically significant difference in the use of certain groups of antibiotics between the male and female population of 15 years in Tuzla Canton. The differences were calculated by chi-square test and no statistically significant differences were found in the types of antibiotics used between the observed categories of subjects. Statistically significant differences were found between the city-village respondents. Namely, in urban and suburban settlements, respondents were more often prescribed macrolide therapy than respondents from rural settlements.

**Table 10.** Differences in the antibiotics used between the observed groups of subjects

<b>Compared categories</b>	<b>N</b>	<b>df</b>	<b>Phi value</b>	<b>Cramer's value</b>	<b>Contingency coefficient</b>	<b>Pearson Chi-Square</b>	<b>Sig. (p)</b>
boys-girls 15 years	1535	5	0,073	0,073	0,073	8.179	0,147
City-Village	1535	5	0,135	0,135	0,134	27.882	0,00001

#### IV. DISCUSSION

The results of the research on the use of antibiotics in the population of boys and girls aged 15 in the area of the city of Tuzla (Table 1) show that 93.8% of the city population was under antibiotic therapy. In the urban settlement, 11.5% of the population used therapy on their own initiative, 9% of boys and 14% of girls.

Table 2 shows the use of antibiotics in the population of boys and girls aged 15 from the suburbs of Tuzla. The results of the research show that the percentage of antibiotic use in both the boys' group and the girls' group is 100%. It is also evident from Table 2 that a significant number of respondents used the therapy on their own initiative without a doctor's prescription. This percentage is slightly higher than among peers from the urban settlement (20.7% boys and 20.4% girls).

This study also examined the use of antibiotics in a 15-year-old population from a rural settlement (Table 3) to see if there were significant differences in antibiotic use between urban and rural children. The results of the research show that in this population as well, the percentage of antibiotic therapy is very high, in the population of boys 99.11%, and in the population of girls 94.83%. The use of antibiotics on their own initiative is slightly lower than in the 15-year-old urban population and amounts to 1% for boys and 3.6% for girls.

Table 5 shows data on differences in antibiotic use between the compared categories. Although the percentage of antibiotic use in all groups of respondents is very high, the table shows that statistically significant differences ( $p < 0.05$ ) in antibiotic use exist between the compared categories: girls city-village  $p = 0.035$  and boys city-village  $p = 0.003$ .

After researching the use of antibiotics in the population of 15 years of urban, suburban and rural settlements, we see that the use of antibiotics in this population is extremely high and that 96.1% of this population of Tuzla Canton was under antibiotic therapy (Table 4). In the total sample of 15-year-old respondents in Tuzla Canton 89.6% of the population use antibiotics only when prescribed by a doctor, while 10.4% of respondents use antibiotics on their own initiative.

Tables 6, 7 and 8 contain data on the types of the most commonly prescribed antibiotics in Tuzla Canton.

The results of the research show that in the 15-year-old population from the area of the city of Tuzla, penicillin antibiotics (ampicillin, amoxicillin) were most often prescribed, with 97.27% of boys and 90.48% of girls receiving therapy with these antibiotics. Respondents who stated that they receive other antibiotics state that the reason is exclusively an allergic reaction to penicillin. The same results were obtained in 15-year-old respondents from suburban areas, where 91.6% of girls and 75.9% of boys were under penicillin therapy. In the population of 15 years of rural settlements, penicillin antibiotics were also most often used, 95.5% in the group of girls and 92% in the group of boys.

After researching the most commonly used antibiotics in the total sample of respondents from Tuzla Canton, we notice that 92.3% of the population used penicillin antibiotics, 1.6% cephalosporin, 5.18% macrolides, 0.68% sulfonamides, 0.57% lincosamide and 0.23% glycopeptide (Table 9).

Table 10 shows data on a statistically significant difference in the use of certain groups of antibiotics between the male and female population of 15 years in Tuzla Canton. Differences were calculated by the chi-square test and no statistically significant differences were found in the types of antibiotics used between boys and girls aged 15 years. Statistically significant differences were found only between city-village respondents. Namely, in urban and suburban settlements, respondents were more often prescribed macrolide therapy compared to respondents from rural settlements.

## V. CONCLUSION

The research confirmed that the use of antibiotic therapy in the 15-year-old population in the Tuzla Canton of Bosnia and Herzegovina is very high, even higher than expected. Higher use of antibiotics was expected in the urban area, but a higher percentage was recorded in the suburbs. Self-initiated use of antibiotics was recorded in all observed groups, which is the highest percentage in the group of 15-year-olds from the suburbs. Based on the results, we can conclude that the use of antibiotics in Tuzla Canton is irrational. They are probably also prescribed for conditions in which antibiotic therapy is not indicated. Since the most commonly used antibiotics are penicillin, doctors prescribe them as the least toxic antibiotics without making an etiological diagnosis, ie. as soon as the first signs appear such as fever, runny nose, cough, although these symptoms are not always a sign of a bacterial infection.

The self-initiated use of antibiotic therapy is also a sign of insufficient awareness of the population in this area about the harmful effects of antibiotics and the appearance of increasing bacterial resistance to them. It is also known that the use of antibiotics in the younger population can be the reason for the appearance of allergic reactions at a later age. Professor Gary Huffnagle points out that the link between allergies and antibiotics is obvious. Wherever the use of antibiotics has increased, the number of people with asthma and allergies has also increased. In countries where the use of antibiotics is not widespread, asthma and allergies are rare [5]. A new study in Berlin confirmed that the increase in asthma and allergies in Western countries is proportional to the increase in the use of antibiotics. So, if a child needs an antibiotic for a bacterial infection, this should not be avoided for fear of allergic disease. But prescribing antibiotics should not be overdone when they are not absolutely necessary, especially for viruses or colds, as they can cause long-term consequences and develop resistance due to overuse.

## VI. FUTURE RESEARCH

Future studies may investigate the use and most commonly used antibiotics in the population of boys and girls in other countries and cultures. Research can also focus on monitoring the decline or rise in irrational use of antibiotics in certain countries and monitoring the antibiotics that are most commonly prescribed, as well as whether that choice is always justified. All of this research can help determine the aforementioned association with allergies at a later age if antibiotics are overused at a younger age.

## REFERENCES

- [1]. <https://www.waya.ba/savjeti-strucnjaka/probavne-smetnje-kod-uzimanja-antibiotika/ceste-bakterijske-infekcije-kod-djece/> Upload 1.10 2019.
- [2]. Nasrin D, Collignon PJ, Roberts L, Wilson EJ, Pilotto LS, Douglas RM. Effect of beta lactam antibiotic use in children on pneumococcal resistance to penicillin: prospective cohort study. *BMJ*. 2002;324(7328):28-30. Craig WA. Does the dose matter? *Clin Infect Dis*. 2001;33 Suppl 3:S233-7.
- [3]. <https://zivim.gloria.hr/zivim/ucim/cijelo-vrijeme-nam-je-pred-nosom-nova-nada-u-borbi-protiv-alergije-i-astme-8661608> (accessed on 20. January 2021).
- [4]. <https://rs.n1info.com/zdravlje/a557986-antibiotici-u-ranom-detinjstvu-povecavaju-rizik-od-alergija/> (accessed on 28. January 2021).
- [5]. <https://alternativa-za-vas.com/index.php/clanak/article/porast-astme-i-alergije> (accessed on 6. February 2021).

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