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ORIGINAL ARTICLE

The effect of the educational program on rational antibiotic use on the knowledge and attitude levels of health technician students

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Abstract

Objectives: The aim of this study is to measure the effect of the education program concerning rational antibiotic use on the knowledge-attitude levels of health technician students towards rational antibiotic use.

Method: This intervention study has been conducted with vocational school students (control group: 437, intervention group: 403) enrolled in the same health services program at two universities. The dependent variable of the study was the Knowledge-Attitude Scale towards Rational Antibiotic Use and the independent variables were the control and intervention groups. The educational program applied in this study included the definitions and distinction between infections, flu and cold, the mechanism of action and types of antibiotics, the consequences of irrational antibiotic use, antibiotic resistance and rational and irrational use of antibiotics.

Result: Both the knowledge and attitude mean scores of the intervention group on the final test were found to be statistically significant and higher than the mean scores of the pre-test. When the final test and retention test score averages of the intervention group were examined, it was found that there was no statistically significant difference between the mean knowledge score and mean attitude score on the final tests and retention tests

Conclusion: This study is the first educational intervention study in Turkey concerning the rational use of antibiotics by health technician candidates. As a result of this study, a significant increase was observed in knowledge-attitude levels on rational antibiotic use after the intervention training concerning rational antibiotic use and in terms of retention.

Keywords: Antibiotics, Attitute, Education, Health Workers, Knowledge

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INTRODUCTION

Antibiotics are drugs used to prevent and treat bacterial infections.[1-3] The World Health Organization (WHO) defines the appropriate use of antibiotics as "the effective use of antibiotics with maximum clinical therapeutic effects, minimum risk of drug-related side effects and the development of antimicrobial resistance (AMR)".[4] The use of antibiotics for the wrong reasons or incorrect use thereof causes bacteria to become resistant to subsequent treatments.[5] Resistant bacteria can reproduce and cause infections despite the presence of antibiotics. This situation poses a danger not only for the person using the antibiotic inappropriately, but also for everyone who is at risk of contracting resistant bacteria at a later stage.[2]

AMD is one of the biggest public health challenges facing humanity at the global level.[6-7] According to the 2016 report of the Antimicrobial Review Committee, 700,000 people worldwide die from infections caused by antibiotic-resistant pathogens and it is estimated that 10 million people a year will be at risk if solutions are not developed to slow down the emergence of antibiotic resistance by 2050.[8] AMR's burden on the economy can also not be ignored. In this context, long-term illnesses and longer hospital stays lead to the need for more expensive drugs and to financial difficulties for those affected, in addition to death and disability.[9]

Irrational use of antibiotics and antibiotic resistance is an important health problem in Turkey, as is also the case for the rest of the world.[10] In Turkey, the daily use of antibiotics is 38.18 per 1000 individuals. With this ratio, Turkey and Greece rank first in Europe.[11]

Antibiotics are called "miracle drugs" because they cure diseases and save lives within a few days. However, the development of resistance of pathogenic bacteria to these drugs currently threatens this miracle.[12] The training program, which was developed with "the first step towards reducing antibiotic resistance is to raise awareness about the importance of antibiotic resistance" [9] in mind, aims to prevent antibiotic resistance and reduce the use of antibiotics. It is thought that increasing the quality of life by decreasing the use of antibiotics, reducing the length of hospital stays and outpatient treatment, decreasing the total costs of treatments and reducing the frequency of antibiotic-resistant bacteria will provide indispensable benefits for the healthcare system, increase efficiency and directly benefit the country's economy.

Considering that healthcare professionals will be more knowledgeable and sensitive about the rational use of antibiotics than other members of the society, it is predicted that they will use less antibiotics.[13] The training process of health technicians consists of a period in which their knowledge, attitudes and behaviors towards healthy behaviors are shaped. For this reason, educating healthcare professionals on the rational use of antibiotics during this time will be significantly effective in reducing antibiotic resistance.[14] However, most of the intervention trainings on antibiotic use to date have been developed for medical doctors and adults.[14-18] Although they play a vital role in raising awareness on health-related issues such as nutrition, adequate physical activity and rational use of medication, there is not enough information in the literature about their perceptions of rational antibiotic use.[7] In this context, this

study will provide training to health technician candidates on rational antibiotic use, due to which their knowledge and attitudes towards the rational use of antibiotics will increase and an important gap in the literature will be filled, since they will become good role models when they start their profession. In addition, it should also be noted that this training program will contribute to and serve as a guide in the formation of a national program and integration into pre-service training. Lastly, it is also important in terms of shedding light on studies to be carried out regarding the more rational use of antibiotics throughout the country.

The aim of this study is to measure the effect of the education program concerning rational antibiotic use on the knowledge-attitude levels of health technician students towards rational antibiotic use.

METHOD

Research Type and Sampling

This intervention study has been conducted with vocational school students (control group: 473, intervention group: 529) enrolled in the same health services program at two universities between October 2019 and March 2020. A total of 92 of the 529 participants in the intervention group who were pre-tested and 70 of the 473 participants in the control group, who were pre-tested were not included in the study due to various reasons (not being able to attend the training, not making the final test or retention test, missing data). Therefore, the data of 437 people in the intervention group and 403 people in the control group were evaluated.

Table 1: Socio-demographic characteristics of participants

		Intervention group (n=437)		Control group (n=403)	
		Number	%	Number	%
Program †	ODH	59	13.5	65	16.1
	PRM	110	25.2	85	21.1
	MLT	97	22.2	63	15.6
	MIT	104	23.8	81	20.1
	MDS	67	15.3	109	27.0
Age	19 years and younger	260	59.5	181	44.9
	20 years and older	177	40.5	222	55.1
Grade	First grade	270	61.8	213	52.9
	Second grade	167	38.2	190	47.1
Sex	Male	82	18.8	110	27.3
	Female	355	81.2	293	72.7
Marital status	Unmarried	429	98.2	388	96.3
	Married	8	1.8	15	3.7
Antibiotic use	Yes	236	54.0	125	31.0
	No	201	46.0	278	69.0

†ODH: Oral and dental health, PRM: Paramedic, MLT: Medical laboratory technician, MIT: Medical imaging technician, MDS: Medical documentation and secretariat

A rate of 25.2% of the participants in the intervention group was enrolled in the PRM program, 59.5% was 19 years of age and younger, 61.8% was in the first grade, 81.2% was female and 98.2% was unmarried. In the control group, 27.0% of the participants was enrolled in the TDS program, 55.1% was older than 20 years of age, 52.9% was in first grade, 72.7% was female and 96.3% was unmarried (Table 1).

Data Collection Form and Variables

Data were collected by face-to-face interviews using a data collection form consisting of two parts. In the first part of the data collection form, six questions about the socio-demographic characteristics of participants and antibiotic use were asked and in the second part, the knowledge-attitude scale for rational antibiotic use developed by Çelebi and Gün (2021)[19] was applied. The scale consisted of knowledge questions about antibiotics consisting of 12 items (item 4 adverse effect) and attitude questions regarding antibiotic use, consisting of 16 items (item 7, item 12, item 13 adverse effect). The knowledge score for rational antibiotic use was calculated between 12 and 60 points and the attitude score for rational antibiotic use was calculated between 16 and 80 points, in which case it could be concluded that the knowledge and attitude are better with a higher mean score. The items in the information part of the knowledge-attitude scale on rational antibiotic use were in accordance with the Likert scale and have been evaluated with the following statements: "strongly agree (1)", "agree (2)", "undecided (3)", "disagree (4)" and 'strongly disagree (5)'. The items in the attitude part of the knowledge-attitude scale on rational antibiotic use were also in accordance with the Likert scale and have been evaluated with the following statements: "Always (1)", "often (2)", "sometimes (3)", "rarely (4)" and 'never (5)'. The Cronbach's alpha coefficient calculated for the reliability of the scale's knowledge questions was 0.87 and the Cronbach's alpha coefficient calculated for the reliability of the attitude questions was 0.89.[19] These values showed that the scale was reliable. The pre-test, final test and retention tests took an average of 15 minutes. The dependent variable of the study was the Knowledge-Attitude Scale towards Rational Antibiotic Use and the independent variables were the control and intervention groups.

Educational Program

The educational program applied in this study included the definitions and distinction between infections, flu and cold, the mechanism of action and types of antibiotics, the consequences of irrational antibiotic use, antibiotic resistance and rational and irrational use of antibiotics.

For each program in the intervention group the trainings were given during five classes (5 x 40 minutes). The education was interactive due to the use of presentations and distribution of a brochure on rational antibiotic use by the researcher. In addition, videos on rational antibiotic use published by the Ministry of Healthcare of the Republic of Turkey were shown to participants.

The intervention group was given a pre-test before the training, a final test after the training and a retention test 30 days after the training. The control group was given a pre-test and a final test 30 days after the pre-test.

Evaluation of Data

The data were analyzed with the SPSS 21.0 package program. The Cronbach's alpha coefficient was calculated to determine the internal consistency reliability level of the scales.

The distribution of participants' personal characteristics is shown as frequency and percentages. As a result of the collected data, it was observed that the data obtained from the pre-tests, final and retention tests showed a normal distribution. The repeated sample t-test was used to analyze whether the data of the students in the intervention and control groups differed according to the total scores of the pre-tests and final tests. In the analysis of whether the total scores of the pre-tests and final tests differed between the intervention and control groups the independent sample t-test was applied. In the analysis of the difference between the final and retention test scores of the intervention group, the repeated sample t-test was applied. A significance level of 0.05 was taken into account and a level of p< 0.05 was found to show a significant difference.

Limitations of the Study

There are three important limitations in this study. These are as follows; the intervention training was given in five different time periods causing a decrease in the number of participants, the study was limited to only health technician students and this study only examined knowledge and attitude but not behaviors.

RESULTS

The independent sample t-test results of the knowledge-attitude scale pre-test and final test scores for rational antibiotic use in the intervention and control groups are given in Table 2.

Table 2: Independent Sample T-Test Results Concerning Rational Antibiotic Use of the Knowledge-Attitude Scale Pre-Test and Final Test Scores in the Intervention - Control Groups

	Group	n	Average	SS	Standard error of the mean	t	p
Pre-test Knowledge score	**Control**	403	38.3	8.8	0.44	-2.913	0.004
	Intervention	437	39.8	5.3	0.21		
Pre-test Attitude score	**Control**	403	54.5	11.3	0.56	-5.884	<0.001
	Intervention	437	58.3	7.3	0.25		
Final test Knowledge score	**Control**	403	38.2	8.6	0.41	-19.044	<0.001
	Intervention	437	47.6	4.9	0.19		
Final test Attitude score	**Control**	403	53.2	11.0	0.55	-28.955	<0.001
	Intervention	437	70.4	5.5	0.26		

When Table 2 is examined, both the knowledge and attitude mean scores of the pre-test and final test of participants in the intervention group were found to be statistically significant and higher than the knowledge and attitude mean scores on the final test of the control group (p<0.001).

Table 3: Repeated T-Test Results Concerning Rational Antibiotic Use of the Knowledge-Attitude Scale Pre-Test and Final Test Scores in the Intervention - Control Groups

	Application	n	Average	SS	Standard error of the mean	t	p
Knowledge score intervention group	**Pre-test**	437	39.8	5.8	0.23	-22.732	<0.001
	Final test	437	47.6	4.9	0.27		
Attitude score intervention group	**Pre-test**	437	58.3	7.3	0.35	-28.494	<0.001
	Final test	437	70.4	5.5	0.26		
Knowledge score control group	**Pre-test**	403	38.3	8.8	0.44	0.190	0.846
	Final test	403	38.2	8.6	0.43		
Attitude score control group	**Pre-test**	403	54.5	11.3	0.56	7.942	<0.001
	Final test	403	53.2	11.0	0.54		

According to Table 3, both the knowledge and attitude mean scores of the intervention group on the final test were found to be statistically significant and higher than the mean scores of the pre-test ($p<0.001$). No statistically significant difference was found between the knowledge mean scores on the pre-test and post-test of the control group. The attitude mean scores of the final test of the control group were found to be statistically significant and lower than the attitude pre-test scores ($p<0.001$).

Table 4: Repeated T-Test Concerning Rational Antibiotic Use of the Knowledge-Attitude Scale Final Test and Retention Test Scores in the Intervention Group

	Application	n	Average	SS	Standard error of the mean	t	p
Knowledge score	Final test	437	47.6	4.9	0.27	0.353	0.098
	Retention Test	437	47.5	7.2	0.23		
Attitude score	Final test	437	70.4	5.5	0.26	0.847	0.056
	Retention Test	437	69.1	6.2	0.26		

When the final test and retention test score averages of the intervention group were examined, it was found that there was no statistically significant difference between the mean knowledge score and mean attitude score on the final tests and retention tests ($p>0.05$).

DISCUSSION

The training given within the scope of this study which was developed to measure the effect of the education program concerning rational antibiotic use provided to health technician students on the level of knowledge-attitude towards rational antibiotic use, increased both the level of knowledge on and attitude towards antibiotics of health technician candidates in the intervention group.

When the final test scores of the control group and intervention group were examined, both the level of knowledge on rational antibiotic use and the level of attitude towards rational antibiotic use were found to be significantly higher in the intervention group than control. In this context, it can be said that the training program concerning rational use of antibiotics is effective in improving the knowledge levels of students and attitudes towards rational antibiotic use. It is assumed that this increase is due to the fact that the educational program included the learning outcomes related to the distinction between flu and cold, the purpose of antibiotic use, antibiotic resistance and rational and irrational use of antibiotics. Similar studies are present in the literature. Trepka et al. (2001) conducted intervention training in Northern Wisconsin by randomly dividing the parents of children younger than four years into experimental and control groups. The antibiotic indication score was applied to the participants before and after the intervention. After the study, the mean antibiotic indication score of the intervention group was found to be significantly higher than that of the control group.[20] Similarly, in a randomized intervention study conducted by Croft et al. (2001) in the USA, the effect of a child care center staff's intervention concerning the knowledge about and attitudes towards appropriate antibiotic use of 659 parents was evaluated. The effectiveness of intervention training was measured with a nine-point knowledge score and a three-point attitude item. As a result of the study, the knowledge about and attitudes towards antibiotics of the intervention group were found to be significantly higher than that those of the control group ($p<0.05$).[21] These results once again revealed that education

had a positive effect on the level of knowledge about and attitude towards antibiotics.

When the analysis results of the pre-test and final test scores of the level of knowledge on rational antibiotic use and attitudes towards rational antibiotic use of the intervention group are examined, there is a statistically significant difference in favor of final test scores. Therefore, it is emphasized once more that education is the pillar for preventing antibiotic resistance and optimization of antibiotic use. Half of inappropriate antibiotic use is due to the lack of knowledge on correct antibiotic use.[22] Pavese et al. (2009) concluded that a one hour education about antibiotic use given to hospitalized patients in a university hospital in the United Kingdom changed their thoughts on antibiotic use but the lasting effects of this training have not been examined.[23] In the intervention study conducted by Razon et al. (2005) with regard to community pediatricians in Israel, multi-dimensional trainings on rational antibiotic use were provided (brochure, small group studies, seminar, etc.) and changes in the frequency of pre- and post-intervention antibiotic prescriptions by community pediatricians were evaluated from the records. As a result of this research a significant decrease in antibiotic prescriptions by pediatricians, who received small-scale group study training, was observed.[14] Furthermore, in the study conducted by Cebotarenco and Bush (2008) with students in Moldova, it was found that after six hours of training on antibiotic use, the level of antibiotic knowledge increased and usage decreased significantly.[5] In this context, it is observed once again that education on the use of antibiotics increases the knowledge and the attitude of the participants.

A significant decrease was observed in the mean score of the final test concerning the rational antibiotic attitude level of the control group. The reason for this difference is thought to be due to the fact that some participants in the control group did not have a clear idea about some of the questions and could have selected different statements in the pre-tests and final tests.

There was no statistically significant difference between the retention and final test scores of the intervention group on the knowledge about and attitude towards rational antibiotic use. Therefore, it can be said that the educational program is lasting. In a study conducted by Azevedo et al. (2013) the effect of intervention training on healthcare students in Portugal was determined and it was concluded that two months after three thirty-minute classes there was a permanent increase in antibiotic knowledge levels.[18] In the intervention study conducted by Lecky et al. (2010) with secondary and high school students in the Czech Republic, France and the United Kingdom, intervention training on antibiotic use was provided through the e-Bug training package. There was no significant decrease in student knowledge in the retention test after a six-week period after the training.[17] In a study conducted in the USA by Taylor et al. (2005), it was observed that the attitudes of parents did not change six weeks after the one-hour intervention training on parental use of antibiotics. In a study conducted one year later, it was concluded that the rate of parents having antibiotics prescribed to their children was the same as before the training.[15] We are of the opinion that the reason why the training program in our study had lasting effects is due to the fact

that the training program was longer and that participants had a better understanding of antibiotic resistance, since they were health services vocational school students. In the study conducted by Mazinski et al. (2017), in which the effects of antibiotic awareness day campaigns on the knowledge and attitudes of the Polish public towards antibiotics were examined, it was observed that the permanent levels of knowledge about and attitudes towards antibiotics of participants increased after the training.[6]

CONCLUSION AND RECOMMENDATIONS

This study is the first educational intervention study in Turkey concerning the rational use of antibiotics by health technician candidates. As a result of this study, a significant increase was observed in knowledge-attitude levels on rational antibiotic use after the intervention training concerning rational antibiotic use and in terms of retention. While the international literature focuses mainly on physicians and the society, our study is the first one in which the importance of training healthcare technicians, who are an important part of the healthcare system, is emphasized. It is recommended that the training program be applied in different sample groups. In addition, it is advised that brochures on the rational use of antibiotics are put up in school libraries and more public service announcements are made.

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