J. Fac. Pharm. Ankara / Ankara Ecz. Fak. Derg., 47(2): 458-466, 2023
Doi: 10.33483/jfpau.1221931

ORIGINAL ARTICLE / ÖZGÜN MAKALE

SURGICAL ORTHOPEDIC PATIENTS' PERCEPTION OF ANTIBIOTIC USE AND ANTIBIOTIC RESISTANCE

CERRAHİ ORTOPEDİ HASTALARININ ANTİBİYOTİK KULLANIMI VE ANTİBİYOTİK DİRENÇ ALGISI

Donjete AHMETAJ[1]*, Nilay AKSOY[2], Barkın BERK[3]

[1]Istanbul Medipol University, Department of Clinical Pharmacy, 34000, Istanbul, Turkey

[2]Altinbas University, Department of Clinical Pharmacy, 34000, Istanbul, Turkey

[3]Istanbul Medipol University, Department of Clinical Pharmaceutical Chemistry, 34000, Istanbul, Turkey

ABSTRACT

Objective: *The aim of the study was to evaluate orthopedic patients' knowledge of antibiotics and antibiotic resistance.*
Material and Method: *Patients admitted to the hospital for orthopedic surgery were given a questionnaire containing a total of 26 questions, 7 multiple choices, nine true and false questions and ten likert scale questions adapted from a survey which has been published by World Health Organization and translated to Albanian to assess their knowledge and attitude toward antibiotics and antibiotic resistance.*
Result and Discussion: *Sixty-two percent of the patients misunderstood the definition of antibiotic resistance and answered yes to the question "Antibiotic resistance occurs when your body becomes resistant to antibiotics and the antibiotic is no longer effective." 62.4% of the patient strongly agreed that 'antibiotic resistance is one of the biggest problems facing the world". Although participants are aware of antibiotic resistance and the potential threats it may pose, their knowledge of the causes of antibiotic resistance and how to prevent it is limited. In conclusion, attempts need to be made to raise antibiotic resistance awareness and knowledge among the Kosovo population.*
Keywords: *Antibiotics, antibiotic resistance, awarenes, knowledge*

ÖZ

Amaç: *Bu çalışmanın amacı ortopedi hastalarının antibiyotikler ve antibiyotik direnci üzerine bilgisini değerlendirmektir.*

* **Corresponding Author / Sorumlu Yazar:** Donjeta Ahmetaj
e-mail / e-posta: donjeta.ahmetaj@hotmail.com, **Phone / Tel.:** +38349102707

Submitted / Gönderilme : 20.12.2022
Accepted / Kabul : 17.02.2023
Published / Yayınlanma : 20.05.2023

Gereç ve Yöntem: *Ortopedi ameliyatı için hastaneye yatırılan hastaların antibiyotikler ve antibiyotik direnci üzerine bilgilerini ve tutumlarını değerlendirmek amacı ile Dünya Sağlık Örgütü tarafından uygulanmış bir anketten uyarlama Arnavutça'ya çevrilen 7 adet çoktan seçmeli, 9 adet doğru yanlış ve 10 adet likert ölçeği sorusu olmak üzere toplamda 26 sorudan oluşan uyarlama anket yöneltildi.*

Sonuç ve Tartışma: *Hastaların yüzde 62'si antibiyotik direncinin tanımını yanlış anlamış ve "Antibiyotik direnci, vücudunuz antibiyotiklere dirençli hale geldiğinde ve artık işe yaramadığında ortaya çıkar." sorusuna evet cevabını vermiştir. Hastaların yüzde 62.4'ü "Antibiyotik direnci dünyanın karşı karşıya olduğu en büyük sorunlardan biridir." ifadesine kesinlikle katıldıklarını belirtmiştir. Katılımcılar antibiyotik direncinin ve sebep olması muhtemel tehlikelerin farkında olmalarına ragmen, antibiyotik direncinin sebeplerine ve antibiyotik direncinin nasıl önleneceğine dair bilgileri kısıtlıdır. Sonuç olarak, Kosova'da antibiyotik direncine dair bilinç ve farkındalığı arttırmaya yönelik çalışmalar yapılması gerekmektedir.*

Anahtar Kelimeler: *Antibiyotik, antibiyotik direnci, bilgi, farkındalık*

INTRODUCTION

Infectious diseases are a leading cause of hospitalizations, emergency department visits, and hospital-based mortality in Kosovo and around the world [1]. The easy access to antibiotics has led to antibiotic overuse, which has accelerated the emergence of antibiotic resistance globally [2]. Antibiotic resistance is brought on by both excessive and inappropriate use of antibiotics [3]. It is known that the regular administration of antibiotics combined with misuse to treat diseases such as flu, common cold, and diarrhea is seen as a major contributor of the antibiotic resistance caused by inadequate public knowledge [4]. Additionally, with the advancement in the biotechnology, broad-spectrum antibiotics became more accessible and the wide and unnecessary use of broad-spectrum antibiotics due to absence of early diagnostics, also raises antibiotic resistance [5]. In addition to direct misuse and overuse of antibiotics, people are also exposed to antibiotics through dairy products. According to the research conducted in Kosovo, dairy cattles are not receiving the prescribed treatment protocol. The uncontrolled use of antibiotics on the treatment of cattles give rise to antibiotics resiude in dairy products which causes daily intake of antibiotics for the population [6]

Planning new strategies to prevent accelerated increase in antibiotic resistance has emerged as one of the biggest obstacles that the public health sector faces [7]. World Health Organization presented the report which estimates by the year 2050, 10 million deaths can occur because of the increased antibiotic resistance [8]. Additionally, it is worthy of attention that there is a solid link between economic well-being of the countries and the antibiotic resistance [9,10]. The reason to this fact can be examined from several aspects such as the accessibility of healthcare services and the knowledge level of the public. Nevertheless, this situation should be resolved across the world because the antibiotic resistance may lead to not only a raise in infectious diseases but also biological alterations in population and bacterial evolution, and the transmission of these threats are easier than ever due globalization and increased travel rate across the world [7,9]. Surgical site infection is the term for an infection that appears in the surgical incision site following surgery. Infections at the surgical site can range from mild, affecting simply the skin, to severe, impacting organs, implanted materials, and tissues below the skin. The incidence of SSI varies greatly depending on the operative site and wound classification, ranging from 5% to 30% [11]. Infection is one of the most common complications in orthopedic surgery which may cause long-term disability, morbidity and mortality [12]. According to WHO, antibiotic-resistant bacteria cause 50% of surgical site infections [13]. Raising public awareness and knowledge about antibiotic resistance, promoting rational antibiotic use, and reducing the incidence of infections through improved hygiene and sterilization are all strategies to combat antibiotic resistance [14]. The implementation of an antibiotic stewardship program strengthens the responsible use of antibiotics while stepping up efforts to combat antibiotic resistance.

A multidisciplinary team made up of microbiologists, clinical pharmacists, and infectious diseases experts should be a part of any ideal antibiotic stewardship program [15]. Kosovo Ortomedica Orthopedic Hospital infection committee strives to accomplish a number of goals, one of which is to

improve patient understanding and awareness toward antibiotic resistance. The primary goal of this study is to determine the level of knowledge and awareness of our patients before implementing an educational program that will benefit all patients who visit the hospital.

MATERIAL AND METHOD

The antibiotic resistance knowledge and awareness of the orthopedic patients was assessed via questionnaire that translated and adapted from a survey which has been published by World Health Organization [16]. The questioner was admitted to five volunteers to ensure the readability before given to the patients. Our patients' complete the questioner and accurate demographic information as well as medical and medication histories was collected.

A questionaire containing 26 questions in total were completed by the patients who have been admitted to the Kosovo Ortomedica Orthopedic Hospital for orthopedic operation during the study period June 2018 to June 2019. Seven multiple choice questions and nine true-false questions in order to assess understanding and knowledge. Ten 5-point Likert questions to gauge the attitude of the patients towards antibiotic resistance. For the statistical analysis, cronbachs alpha was employed to assess the reliability of the questionaire; the responses for the patients were described as frequencies and percentage.

RESULT AND DISCUSSION

Within the scope of the study the questionnaires were directed to the total of 93 patients comprising 54 women (58%, n=93) and 39 men (42%, n=93). The average age in the 93 participating patients participated to the study is 54.9 ±21.9. Before directing the questionnaires about antibiotic and antibiotic resistance, the general health condition of the patients was examined. Comorbidity present among 32 of the patients (34.4%, n=93) and 27 patients (29%, n=93) had hypertension while 3 patients had Hyperlipidemia. Additionally, 1 patient (1.1%, n=93) had lower respiratory tract infection.

The reason for admission were, Coxarthrosis (5%, n=93), Gonarthrosis (9.6%, n=93), Muscle contractures (2%, n=93), Anterior cruciate ligament (6.4%, n=93), Plateau fracture (2%, n=93), Achile contractor Standing deformity (2%, n=93), femur fracture (2%, n=93), spinal stenosis (5.3%, n=93), Developmental Hip Fracture (8.6%, n=93), Meniscopathy (13.9%, n=93), Bilateral gonarthrosis (8.6%, n=93), and 1 patient each with the following conditions. tumoral mass in the sacrum tibia fracture elbow dislocation, femur and tibia deformation, bilateral developmental hip fracture etc. The cronbach alpha for the questionaire was 0.71, so we decide to rely on the patients' responses. The last time when the patients used antibiotics were in the last month for 16 (17.2%, n=93), for 29 (31.2%, n=93) it is in the last 6 months, 19 (20.4%) it is in the last year, while 19 of the patients (20.4%, n=93) had used antibiotics more than a year ago, lastly 2 patients (2.2%, n=93) never used antibiotics and 8 patients (8.6%) stated that they could not remember when they used antibiotics for the last time.

When these results are compared with an international study including participants from 12 countries, namely, Nigeria, South Africa, Barbados, Mexico, India, Indonesia, Russian Federation, Serbia, Egypt, Sudan, China, and Vietnam. It is seen that the use of antibiotic is very low in Kosovo in comparison to the average ratio of patients who took antibiotics in the last 6 months in these 12 countries, which is 65% [16]. Another comparative study subjecting pharmacy students in Australia and Sri Lanka, which is conducted to assess the use of antibiotics and awareness of microbial resistance showed very similar ratio on the last time participants used antibiotics [17]. The students in Australia who used antibiotics within the last year is 17% and in Sri Lanka it is 11% whereas it is 21% in Australia and 36% in Sri Lanka for the antibiotic consumption in the last 6 months [17]. While 50 of the patients (53.8%, n=93) answering the question if they use antibiotics as yes, 27 (29.0%, n=93) of the patients said no.

Then, the question regarding when they stop taking antibiotics during the treatment was directed to the patients, 42 (45.2%, n=93) of the patients answered as when they felt better, 33 (35.5%, n=93) of the participants declared they took all antibiotics as stated, 18 patients (19.4%, n=93) answered as they did not know. The results were compared to the pharmacy students in Australia and Sri Lanka, although the results regarding the use were very close, answers for when to stop taking antibiotics are significantly different. 4% of the students in Australia and 21% of the students in Sri Lanka answered as when they

feel better which is significantly smaller in comparison to 33% of the orthopedic patients in Kosovo [17]. The antibiotic knowledge of patients is represented in Table 1.

Table 1. Patients responses to the antibiotic knowledge questions

Multiple-Choice Questions	Choices	Number of Patients	Percentage of Patients
Age	0-20	13	13.9
	21-40	27	29
	41-60	31	33.3
	61-80	20	21.5
	81-100	2	2.1
When was the last time you used antibiotics?	Last month	16	17.2
	Last 6 months	29	31.1
	Last year	19	20.4
	More than a year ago	19	20.4
	Never	2	2.1
	Not remember	8	8.6
Did you take antibiotics from a doctor?	Yes	50	53.7
	No	30	32.2
	Not remember	13	13.9
Did you take advice from a doctor, nurse or pharmacist about how to use antibiotics?	Yes	50	53.7
	No	27	29
	Not remember	16	17.2
When do you stop taking antibiotics?	When I feel better	42	45.1
	As prescribed	33	35.4
	Not know	18	19.3
Is it okay to use antibiotics given to someone else as long as they are used to treat the same disease?	Yes	49	52.6
	No	30	32.2
	Not Know	14	15
Is it okay to buy the same antibiotics or request them from a doctor if you are sick and they have helped you fight the same symptoms in the past?	Yes	51	54.8
	No	26	27.9
	Not remember	16	17.2
Which of the diseases/conditions can be treated with antibiotics do you think?	HIV/AIDS	26	28
	Gonorrhoea	44	47.3
	Bladder infection / Urinary tract infection	37	39.8
	Diarrhea	33	35.5
	Cold/Flu	45	48.4
	Malaria	24	25.8
	Measles	25	26.9
	Skin infection	47	50.5
	Traumatic wound	38	40.9
	Sore throat	38	40.9
	Headache	4	4.3
	General body pain	12	12.9

Among the participating group, when asked ‘which of the diseases/conditions can be treated with antibiotics do you think?’ 26 patients (28.0%) answered as HIV/AIDS, 37 patients (39.8%) answered as bladder infection or urinary tract infection, 33 patients (35.5%) answered as diarrhea, 45 patients (48.4%) answered as either cold or flu, and 24 patients (25.8%) answered as malaria. Measles was chosen by 25 patients (26.9%), skin infection was chosen by 47 patients (50.5%). Also 42 patients (45.2%) answered as traumatic wound, 38 patients (40.9%) answered as sore throat and 4 patients (4.3%)

answered as headache while 12 patients (12.9%) answered general body pain. In comparison, pharmacy students from Australia answered as gonorrhoea (63%), bladder infection (92%) and skin wound infection (90%) whereas students in Sri Lanka 30%, 76% and 80% respectively [17]. These findings show that the public in many countries has relatively little general understanding about the correct consumption of antibiotics.

When asked if they get advice while using antibiotics, while 51 participants (54.8%, n=93) answered as they do, 16 participants (28%, n=93) stated that they don't get advice and lastly 16 (17.2%, n=93) did not remember.

To the question "Is it okay to use antibiotics given to someone else as long as they are used to treat the same disease?" 50 of the patients (53.8%) answered as yes, it is okay while 29 patients (31.2%) answered as no, it is not okay, and 14 of the patients (15.1%) did not remember.

When the question was asked across 12 aforementioned countries, although the answer should be no, 25% of the patients responded as yes [16]. Another study examining the extensity of self-medication of antibiotics over university students in Cairo, Egypt shows that 83.1% of the students use antibiotics relying on experience of similar symptoms [18]. When the reasons and motivation of this behaviour were questioned in another study, 47.3% of the participants from Cairo thinks that the common diseases do not require doctor consultation. Also, as already underlined, the financial aspect of the medical visits has influence on the self-medication and 33.8% of the participants stated the reason of self-medication as a result of financial issues [19]. This suggests that the public in general should be better informed about the working mechanism of antibiotics and should be educated why antibiotics cannot be shared. Also, this situation should be better examined and the relation between antibiotics sharing, and accessibility of health service should be investigated. Because it might be the situation that, if a person struggles to access to the professional health service, then they may turn to unprofessional 'help' which is a threat to public health.

Following that, it is asked "Is it okay to buy the same antibiotics or request them from a doctor if you are sick and they have helped you fight the same symptoms in the past?" The answer to the question was yes from 51 patients (54.8%) and no from 26 patients (28.0%) while 16 of the patients (17.2%) did not remember. These results from Kosovo are especially compatible with the results from other 12 countries in which the average of the 'yes' answers is 43% [16]. This situation especially should be taken under examination with the healthcare professionals who may seem to face persistence of patients to prescribe unnecessary antibiotics.

This pattern also shows itself as use of non-prescribed antibiotics when the drug tracking policies are not strength. One of the studies which is conducted to evaluate the use of non-prescription antibiotics in Nsukka Nigeria shows that more than 86% of the participants use non-prescribed antibiotics [18]. The sample size of the study is given as 400 and the age range of the participants are given between 18-60 years. According to the study, the use of non-prescribed antibiotics is very common regardless of sex, age or education level in Nigeria [20].

According to these results, it is clearly shown that the use of antibiotics is quite common. According to the data presented above, the use of antibiotics is terminated when the patient starts feeling better rather than the physician recommendation. Patients fail to see the sensitivity in the use of antibiotics and pressure physicians to prescribe the antibiotic they receive advice from. Similarly, there is a common but wrong idea that an antibiotic that is good for a family member can be used by them when they show similar symptoms.

Various questionnaires were given to the participants to evaluate their understanding of antibiotics and antibiotic resistance. The 9 questions were answered as True or False by patients and the responses with the corresponding percentage are given in the Table 2.

The results presented in Table 2 shows that the main frame of the antibiotic resistance is conceptually well-established in the vast of majority. The patients are aware of the fact that antibiotic resistance complicate the treatment and has negative effects on the process. However, most of the patients are not aware of the extensive use of antibiotics in the production sector.

Table 2. Results of the analysis of the patients' attitudes towards antibiotics.

Knowledge-Based Questions	**Answers**	**Number and percentage of patients answered**	
		N	**%**
Antibiotic resistance occurs when your body becomes resistant to antibiotics and the antibiotic is no longer effective. (false)	True False	62 31	66.7 33.3
Many infections are becoming more resistant to antibiotic therapy. (true)	True False	55 38	59.1 40.9
If bacteria are resistant to antibiotics, the infections they cause may be very difficult or impossible to treat. (true)	True False	58 35	62.4 37.6
Antibiotic resistance is a problem that can affect my family or me. (true)	True False	56 37	60.2 39.8
Antibiotic resistance is a problem in other countries, but not in Kosovo. (false)	True False	55 38	59.1 40.9
Antibiotics are widely used in agriculture and breeding farms in Kosovo. (true)	True False	26 67	28.0 72.0
Antibiotic resistance is only a problem for people who take antibiotics regularly. (false)	True False	61 32	65.6 34.4
Bacteria that are resistant to antibiotics can be transmitted from person to person. (true)	True False	55 38	59.1 40.9
Antibiotic-resistant infections can make medical procedures such as surgery, organ transplants and cancer treatment much more dangerous.(true)	True False	43 50	46.2 53.8

In the last part of the survey of the study, the fact that 62.4% of the patients stated that antibiotic resistance is one of the biggest problems facing the world, 49.5% of them are worried about the impact of antibiotic resistance on their own and their family's health are noteworthy results considering the awareness of the possible threat caused by the increased antibiotic resistance. Whereas 97% and 72% of the pharmacy students from Australia and Sri Lanka thinks that antibiotic resistance is an issue that could affect them or their family, respectively [17]. It is seen that the awaresness regarding the possible threat posed by antibiotic resistance is better acknowledged by the students compared to the patients.

On the other hand, 45.2% of the patients think that they are not at risk of acquiring antibiotic-resistant infections as long as they take antibiotics correctly. Also, when the same question is asked to the students, 89% and 70% of the students from Australia and Sri Lanka respectively stated that antibiotic resistance is only problem for people who take antibiotics regularly [17]. According to these results, it is seen that both the patients and the pharmacy students should be better trained from the aspect of the mechanism of antibiotic resistance.

Similarly, 41.9% of patients think that antibiotics left over from previous treatments should not be used to cure other diseases, and 39.8% think that doctors should prescribe antibiotics only when needed.

Following that, to evaluate their perspectives on antibiotics, 10 questions were directed to the patients and answered on 5-point likert scales as Strongly Agree, Slightly Agree, Undecided, Slightly Disagree and Strongly Disagree. The results with corresponding statistics are given in the Table 3. When the results given in Table 2. are evaluated in detail it is seen that even though the 60.2% of the patients answered the questions 'Antibiotic resistance is a problem that can affect my family or me.' as yes and 39.2% answered as no, when they answer the question 'I am concerned about the impact of antibiotic resistance on my health and the health of my family.' with the options Strongly Agree, Slightly Agree, Undecided, Slightly Disagree and Strongly Disagree statements, none of the patients chose strongly disagree and 76.4% of the patients answered as either Agree of Strongly Agree.

On the other hand, when the answers for the following questions from two survey are more competent. 65.6% of the patients think that antibiotic resistance is only a problem for people who take

antibiotics regularly. Also, 75.3% of the patients are either agree or strongly agree to the thought that if they take their antibiotics right, they are not at risk of getting antibiotic-resistant infections.

Additionally, when the questions regarding to the use of antibiotics in production sector, although only 28% of the patients think that Antibiotics are widely used in agriculture and breeding farms in Kosovo and only 73.9% of the patients agree or disagree with the statement of farmers should give less antibiotics to breeding.

Table 3. The results of the patients' knowledge regarding antibiotic resistance.

	Strongly Disagree		**Disagree**		**Indecisive**		**Agree**		**Strongly Agree**		
	f	**%**	**f**	**%**	**f**	**%**	**f**	**%**	**f**	**%**	**Mean ± sd**
Antibiotic resistance is one of the biggest problems facing the world.	1	1.1	3	3.2	3	3.2	28	30.1	58	62.4	4.495±0.803
I am concerned about the impact of antibiotic resistance on my health and the health of my family.	0	0.0	8	8.6	14	15.1	25	26.9	46	49.5	4.172±0.985
If I take my antibiotics right, I'm not at risk of getting antibiotic-resistant infections.	1	1.1	7	7.5	15	16.1	28	30.1	42	45.2	4.108±1.005
People should only use antibiotics when prescribed by a doctor.	1	1.1	6	6.5	15	16.1	33	35.5	38	40,9	4.086±0.963
People should not use leftover antibiotics from previous treatments to cure other diseases.	1	1.1	6	6.5	14	15.1	33	35.5	39	41,9	4.108±0.961
Doctors should prescribe antibiotics only when needed.	2	2.2	11	11.8	8	8.6	35	37.6	37	39,8	4.011±1.078
People like me can do little to fight against antibiotic resistance.	3	3.2	12	12.9	9	9.7	25	26.9	44	47,3	4.022±1.179
Everyone should use antibiotics responsibly.	6	6.5	6	6.5	14	15.1	23	24.7	44	47,3	4.000±1.216
People should wash their hands regularly.	6	6.5	5	5.4	8	8.6	39	41.9	35	37,6	3.989±1.128
Farmers should give less antibiotics to breeding.	12	13.0	5	5.4	7	7.6	29	31.5	39	42,4	3.848±1.374

In other words, although, the general knowledge regarding the use of antibiotics in production sector is not significantly high among the participants; more than half of the patients stated that they think farmers should use less antibiotics during production.

According to these results and statements, it is seen that there is an obvious awareness against to the danger and significance of antibiotics resistance. Majority of the group thinks that this global problem must be taken seriously, and antibiotics should be only prescribed by physicians and the patients must use in accordance with the given instructions.

However, there is also significant lack of information regarding the ways of contributing to the antibiotic resistance and the correct way of using antibiotics across not only the patients in Kosovo but also in pharmacy students in Australia, Sri Lanka, and university student in Egypt. The comparison suggests that the knowledge regarding antibiotics and antibiotics resistance needsto be improved. Although there are several ways to train public on these aspects, according to the study employing pharmacies showed that education significantly improves the adherence to the prescribed use of antibiotics [21].

In conclusion, the answers of the patients show that general knowledge regarding the danger of antibiotic resistance is internalized by the population. However, these results explicitly indicate that the reasons and the impacts of antibiotic resistance should be explained more to the public. Population with increased awareness will not only avoid direct overuse and misuse of antibiotics but also prevent the

unintentional consumption through dairy products and have significant impact on the expanse of antibiotic resistance.

AUTHOR CONTRIBUTIONS

Concept: D.A., N.A., B.B.; Design: D.A., N.A., B.B.; Control: D.A., N.A., B.B.; Sources: D.A.; Materials: D.A.; Data Collection and/or Processing: D.A.; Analysis and/or Interpretation: D.A.; Literature Review: D.A.; Manuscript Writing: D.A., N.A.; Critical Review: D.A., N.A., B.B.; Other: -

CONFLICT OF INTEREST

The authors declare that there is no real, potential, or perceived conflict of interest for this article.

ETHICS COMMITTEE APPROVAL

The authors state that they have obtained appropriate institutional review board approval or have followed the principles outlined in the Declaration of Helsinki. Additionally, informed consent has been obtained from the participants involved prior to the data collection. All procedures performed were in accordance with the ethical guidelines of the Chamber of Pharmacists of Kosovo Non-invasive Ethical Committee (Decision Number: 12.11.2021/378).

REFERENCES

1. Goto, T., Yoshida, K., Tsugawa, Y., Camargo Jr, C.A., Hasegawa, K. (2016). Infectious disease-related emergency department visits of elderly adults in the United States, 2011-2012. Journal of the American Geriatrics Society, 64(1), 31-36. [CrossRef]
2. Llor, C., Bjerrum, L. (2014). Antimicrobial resistance: risk associated with antibiotic overuse and initiatives to reduce the problem. Therapeutic Advances in Drug Safety, 5(6), 229-241. [CrossRef]
3. Alharbi, M.H., Khormi, A.Y., Albisher, A.M., Barkoot, M.M., Alsofyani, B.A., Althabet, F.M., Aljehani, H.S. (2017). The dangerous effects of excessive use of antibiotics among community in Saudi Arabia. Egyptian Journal of Hospital Medicine, 69(5), 2493-2496. [CrossRef]
4. Laxminarayan, R., Duse, A., Wattal, C., Zaidi, A.K., Wertheim, H.F., Sumpradit, N., Vlieghe, E., Hara, G.L., Gould, I.M., Goossens, H., Greko, C., So, A.D., Bigdeli, M., Tomson, G., Woodhouse, W., Ombaka, E., Peralta, A.Q., Qamar, F.N., Mir, F., Kariuki, S., Cars, O. (2013). Antibiotic resistance-the need for global solutions. The Lancet Infectious Diseases, 13(12), 1057-1098. [CrossRef]
5. Akova, M. (2016). Epidemiology of antimicrobial resistance in bloodstream infections. Virulence, 7(3), 252-266. [CrossRef]
6. Ibraimi, Z., Shehi, A., Murtezani, A., Krasniqi, S., Agani, Z. (2015). Kosovo's public health damage from abusive use of antibiotics in dairy cattle. Mater Socio-Medica, 27(3), 149-153. [CrossRef]
7. Hawkey, P.M. (2015). Multidrug-resistant gram-negative bacteria: A product of globalization. The Journal of Hospital Infection, 89(4), 241-247. [CrossRef]
8. Pulingam, T., Parumasivam, T., Gazzali, A.M., Sulaiman, A.M., Chee, J.Y., Lakshmanan, M., Chin, C.F., Sudesh, K. (2022). Antimicrobial resistance: Prevalence, economic burden, mechanisms of resistance and strategies to overcome. European Journal of Pharmaceutical Sciences, 170, 106103. [CrossRef]
9. Baquero, F. (2021). Threats of antibiotic resistance: An obliged reappraisal. International Microbiology, 24(4), 499-506. [CrossRef]
10. Ahmad, A., Sundararajan, P., Patel, I., Praveen, N., Balkrishnan, R., Mohanta, G. (2012). Evaluation of self-medication antibiotics use pattern among patients attending community pharmacies in rural India, Uttar Pradesh. Journal of Pharmacy Research, 5, 765-768. [CrossRef]
11. Oxman, D.A., Issa, N.C., Marty, F.M., Patel, A., Panizales, C.Z., Johnson, N.N., Licona, J.H., McKenna, S.S., Frendl, G., Mentzer, S.J., Jaklitsch, M.T., Bueno, R., Colson, Y., Swanson, S.J., Sugarbaker, D.J., Baden, L.R. (2013). Postoperative antibacterial prophylaxis for the prevention of infectious complications associated with tube thoracostomy in patients undergoing elective general thoracic surgery: A double-blind, placebo-controlled, randomized trial. JAMA Surgery, 148(5), 440-446. [CrossRef]
12. Musmar, S.M., Ba'ba, H., Owais, A. (2014). Adherence to guidelines of antibiotic prophylactic use in surgery: a prospective cohort study in North West Bank, Palestine. BMC Surgery, 14(69), 1-7. [CrossRef]
13. World Health Organization Web site. (2016). Retrieved November 5, 2022 from https://www.euro.who.int/. Accessed date: 05.11.2022.

14. Uchil, R.R., Kohli, G.S., Katekhaye, V.M., Swami, O.C. (2014). Strategies to combat antimicrobial resistance. Journal of Clinical and Diagnostic Research, 8(7), ME01-ME4. [CrossRef]
15. de With, K., Allerberger, F., Amann, S., Apfalter, P., Brodt, H.R., Eckmanns, T., Fellhauer, M., Geiss, H.K., Janata, O., Krause, R., Lemmen, S., Meyer, E., Mittermayer, H., Porsche, U., Presterl, E., Reuter, S., Sinha, B., Strauß, R., Wechsler-Fördös, A., Wenisch, C., Kern, W.V. (2016). Strategies to enhance rational use of antibiotics in hospital: a guideline by the German Society for Infectious Diseases. Infection, 44(3), 395-439. [CrossRef]
16. World Health Organization antibiotic resistance: multi-country public awaresness survey. (2015). Retrieved August 2, 2018, from https://apps.who.int/iris/bitstream/handle/10665/194460/9789241509817_eng.pdf. Accessed date: 02.08.2018
17. Sakeena, M.H.F., Bennett, A.A., Carter, S.J., McLachlan, A.J. (2019). A comparative study regarding antibiotic consumption and knowledge of antimicrobial resistance among pharmacy students in Australia and Sri Lanka. Plos One, 14(3), 1-14. [CrossRef]
18. Elden, N.M.K., Nasser, H.A., Alli, A., Mahmoud, N., Shawky, M.A., Ibrahim, A.A.E.A., Fahmy, A.K. (2020). Risk factors of antibiotics self-medication practices among university students in Cairo, Egypt. Open Access Macedonian Journal of Medical Sciences, 8(E), 7-12. [CrossRef]
19. Elmasry, A.A.G., Bakr, A.S.M., Kolkailah, D.A.A.A., Khaskia, M.A.I., Mohammed, M.E.E., Riad, O.H.M.A., Abdelrahman, S.A.K. (2013). Pattern of antibiotic abuse - a population based study in Cairo. Egyptian Journal of Chest Diseases and Tuberculosis, 62(1), 189-195. [CrossRef]
20. Badger-Emeka, L.I., Emeka, P.M., Okosi, M. (2018). Evaluation of the extent and reasons for increased non-prescription antibiotics use in a university town, Nsukka Nigeria. International Journal of Health Sciences, 12(4), 11-17.
21. West, L.M., Cordina, M. (2019). Educational intervention to enhance adherence to short-term use of antibiotics. Research in Social and Administrative Pharmacy, 15(2), 193-201. [CrossRef]