

Evaluation of Knowledge and Attitudes Regarding Rational Drug Use of Individuals Applying to the Oral and Maxillofacial Surgery Clinic: A Cross-Sectional Study

Ağız ve Çene Cerrahisi Kliniğine Başvuran Bireylerin Akılcı İlaç Kullanımına İlişkin Bilgi ve Tutumlarının Değerlendirilmesi: Kesitsel Bir Çalışma

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ABSTRACT Objective: The aim of this study is to determine the knowledge and attitudes of individuals who applied to the oral and maxillofacial surgery clinic about rational drug use and to reveal whether these knowledge and attitudes differ according to demographic characteristics. **Material and Methods:** This cross-sectional survey study was conducted on patients admitted to the oral and maxillofacial surgery clinic of a university. In the study, a 21-item "rational drug use scale" was used to measure the participants' knowledge and attitudes about rational drug use. $p < 0.05$ was determined as the significance level. **Results:** A total of 247 participants in the 18-65 age range (mean age 36.03 ± 12.92) were included in the study. More than half of the participants (56.7%) showed attitudes and behaviors suitable for rational drug use by getting 35 points or more on the scale. Only 58.3% of the participants expressed a positive opinion that herbal products can have undesirable effects and that they should use the drug as long as the doctor recommends. There were significant differences between participant scores in terms of gender, age, education level, profession, and distance to a health institution. **Conclusion:** The results of this study showed that a significant part of the participants (43.3%) exhibited attitudes and behaviors that are not suitable for rational drug use and that there is a need for training on this subject. The society should be informed more about rational drug use through media tools such as public service announcements.

Keywords: Rational drug use; oral and maxillofacial surgery; dentistry, individuals; awareness

ÖZET Amaç: Bu çalışmanın amacı, ağız ve çene cerrahisi kliniğine başvuran bireylerin akılcı ilaç kullanımına ilişkin bilgi ve tutumlarını belirlemek ve bu bilgi ve tutumların demografik özelliklere göre farklılık gösterip göstermediğini ortaya koymaktır. **Gereç ve Yöntemler:** Bu kesitsel anket çalışması, bir üniversitenin ağız ve çene cerrahisi kliniğine başvuran hastalar üzerinde gerçekleştirildi. Araştırmada, katılımcıların akılcı ilaç kullanımına ilişkin bilgi ve tutumlarını ölçmek için 21 maddelik "akılcı ilaç kullanımı ölçeği" kullanıldı. Anlamlılık düzeyi olarak $p < 0,05$ olarak belirlendi. **Bulgular:** Çalışmaya 18-65 yaş aralığında (ortalama yaş $36,03 \pm 12,92$) toplamda 247 katılımcı dâhil edildi. Katılımcıların yarısından fazlası (%56,7) ölçekten 35 puan ve üzeri alarak akılcı ilaç kullanımına uygun tutum ve davranışlar sergiledi. Katılımcıların sadece %58,3'ü bitkisel ürünlerin istenmeyen etkileri olabileceği ve ilacı doktorun önerdiği süre kadar kullanmaları gerektiği konusunda olumlu görüş bildirdi. Katılımcıların puanları arasında cinsiyet, yaş, eğitim düzeyi, meslek ve sağlık kuruluşuna uzaklık açısından anlamlı farklılık vardı. **Sonuç:** Bu çalışmanın sonuçları, katılımcıların önemli bir bölümünün (%43,3) akılcı ilaç kullanımına uygun olmayan tutum ve davranışlar sergilediğini ve bu konuda eğitime ihtiyaç olduğunu göstermiştir. Kamu spotları gibi medya araçlarıyla akılcı ilaç kullanımı konusunda toplum daha fazla bilgilendirilmelidir.

Anahtar Kelimeler: Akılcı ilaç kullanımı; ağız ve çene cerrahisi; diş hekimliği; bireyler; farkındalık

Medication is one of the most important forms of treatment in contemporary medical practices, and when used rationally, it reduces mortality and morbidity in various diseases, and adversely affects pub-

lic health when not used correctly.¹ The World Health Organization (WHO) has defined rational drug use (RDU) as "to easily provide the appropriate drug, at the appropriate time and dose, at the lowest cost, and

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according to the clinical findings and individual characteristics of the individuals.”² RDU is a systematic approach that starts with the correct diagnosis of the patient, selecting the most effective treatment according to the characteristics of the patient, initiating the treatment, monitoring and evaluating the results.³

Irrational drug use (IDU) is an important health problem in all countries, especially in underdeveloped countries, and is also considered a habit that is difficult to correct.⁴ WHO reported that half of the patients did not comply with the treatment and had IDU problems.⁵ The main irrational drug practices are as follows: Prescribing more than necessary drugs, using drugs incorrectly, using expensive drugs unnecessarily, using drugs without consulting the physician, discontinuing the drugs used before the time recommended by the physician, changing the dosage of drugs without consulting the physician.⁶ Use of drugs that are not in accordance with the RDU may cause negative consequences such as an increase in morbidity and mortality, deterioration or decrease in patient treatment compliance, negative results due to drug interactions, development of resistance to drugs, prolongation of disease duration, recurrence of diseases, side effects, decrease in treatment success, decrease in patients’ belief in treatment, decrease in the availability of drugs, increased treatment costs and wastage of limited resources.⁷

As in other health fields, problems related to IDU are common in dentistry.⁸ Dentists prescribe a variety of medications specific to their field, primarily analgesics and antibiotics. It has been reported that 9-10% of all antimicrobial drugs prescribed in the United Kingdom were prescribed by dentists.⁹ In a study conducted in Türkiye, 39.4% of the participants stated that they had used drugs for dental reasons in the last year.¹⁰ The physician who decides to use the drug, the pharmacist who provides the drug under appropriate conditions, the nurse who administers the drug and, the patient who is treated constitute the parties responsible for RDU. The RDU process requires all health professionals (physicians, pharmacists, and other health personnel), society, the government and, the pharmaceutical industry to act rationally and contribute.¹¹ Although research on the determination of the problems related to RDU is frequently carried out

today, the number of these studies is quite limited in dentistry.¹² In this study, it was aimed to determine the knowledge and attitudes of patients who applied to the oral and maxillofacial surgery clinic about RDU and to reveal whether the knowledge and attitudes about RDU differ according to demographic characteristics.

MATERIAL AND METHODS

STUDYING GROUP AND DESIGN

This descriptive and cross-sectional survey was conducted in March 2022 at Afyonkarahisar University of Health Sciences, Faculty of Dentistry, Department of Oral and Maxillofacial Surgery. Ethical approval was obtained from Afyonkarahisar Health Sciences University, Clinical Research Ethics Committee for the study (date: November 05, 2021, no: 2021/509), and the study was conducted according to the principles of the Declaration of Helsinki.

The minimum sample size required for the study was calculated as 197 subjects using G*Power version 3.1.9.2 (Heinrich-Heine-Universität, Düsseldorf, Germany; power 0.80, $\alpha=0.05$), based on data from a previous study.⁶ The study group consisted of 247 participants over the age of 18 who applied to Afyonkarahisar Health Sciences University, Faculty of Dentistry, Department of Oral and Maxillofacial Surgery for examination and treatment. All participants in the study were informed about the study and their informed consent was obtained. Persons who did not agree to participate in the study had communication problems and did not answer 90% of the questions in the questionnaire were not included in the study.

DATA COLLECTION TOOL

The “RDU scale” created by Demirtaş et al. was used in the study.¹³ The Turkish validity and reliability of the scale were made by the same researchers and it was found to be valid and reliable to measure the RDU of individuals. In the first part of the questionnaire used in the study, sociodemographic characteristics and background information (age, gender, educational status, occupation, monthly income level, distance of residence to a health facility, chronic dis-

ease status, number of prescriptions written annually) were included, while the second part included the RDU scale.

The scale, which evaluated knowledge and attitudes about RDU, consisted of 10 correct, and 11 incorrect, a total of 21 propositions. Each proposition was asked to be evaluated as ‘true’, ‘false’, and ‘I don’t know.’ Correct answers were scored “2 points”, wrong answers were scored “0 points”, while the option “I don’t know” was scored “1 point.” The maximum score that could be obtained from the scale was 42, and those who scored 35 and above were considered to have RDU knowledge.

STATISTICAL ANALYSIS

Data analysis was performed using the SPSS 20.0 program (IBM SPSS Statistics 20, SPSS inc., an IBM Co., Somers, NY). The demographic characteristics of the study group were analyzed with descriptive statistics (frequencies, ratios, means, median). The Kolmogorov-Smirnov test was used to assess whether the scale total scores showed normal distribution. Due to the normal distribution of the data, independent samples t-tests and one-way ANOVA tests were used. The significance level was accepted as $p < 0.05$.

RESULTS

The socio-demographic and background characteristics of the participants are presented in [Table 1](#). The majority of the participants (65.6%) were female. The age range of the participants ranged from 18-65 (mean age 36.03 ± 12.92). The majority of the participants (64%) had a monthly income of less than 4,000 TL and housewives constituted the largest occupational group with 43.3%. About a quarter of the participants (25.1%) had at least one systemic disease and were using drugs related to it. The number of prescriptions written annually was a minimum of one and a maximum of 20 (mean 5 ± 3.57) ([Table 1](#)).

[Table 2](#) shows the percentage change in the correct answers given by the participants to the questions in the RDU scale. All participants correctly answered the question “We should consult our doctor when we see any undesirable effects while using the drug.”

TABLE 1: Socio-demographic and background characteristics of the participants.

	Number (n)	Percent (%)
Gender		
Female	162	65.6
Male	85	34.4
Age		
Under 25 years	63	25.5
25-49 years	149	60.3
50 years and above	35	14.2
Educational level		
Primary school	63	25.5
Secondary School	46	18.6
High School	83	33.6
Bachelor and above	55	22.3
Occupation		
Housewife	107	43.3
Student	47	19
Worker	35	14.2
Officer	27	10.9
Self-employment	13	5.3
Retired	9	3.6
Unemployed	9	3.6
Monthly income level		
Under 4,000 TL	158	64
4,000-8,000 TL	67	27.1
8,000 TL and above	22	8.9
Distance to health facility		
Less than 1 km	76	30.8
More than 1 km	171	69.2
Chronic disease status		
Yes	62	25.1
None	185	74.9
Number of prescriptions written annually		
Less than 5	164	66.4
5-9	64	25.9
10 and above	19	7.7
Total	247	1000

TL: Turkish lira; km: Kilometer.

Apart from this, the statements “Only physicians can recommend medication” and “The doctor determines whether we need medication when we get sick” were answered correctly with the highest percentages (99.2% and 98%, respectively). The propositions answered with the lowest percentage (58.3%) were “Consuming herbal products as much as desired is not harmful to health” and “We can stop using medication when we feel good during the treatment.” The correct response rate in all statements was over 50% ([Table 2](#)).

TABLE 2: Correct answers given by the participants to the questions in the RDU scale (%).

	Correct answer (%)
1. Only physicians can suggest medication	99.2
2. There is no harm in recommending medication to our relatives who have similar complaints	82.2
3. When we get sick, the doctor determines whether we need medication or not	98
4. Drugs can have negative effects as well as positive effects	80.6
5. All drugs produce the same side effects	75.7
6. It is not harmful to take the medicine frequently at the time intervals specified by the doctor	72.9
7. It can be learned from the instructions for use that the drugs should be taken on an empty or full stomach	81.4
8. Not using the drug during the treatment period specified by the doctor may prevent healing	68
9. Herbal products can be used instead of medicines	61.9
10. Consuming herbal products as much as desired is not harmful to health	58.3
11. When we see any undesirable effects while using the drug, we should consult our doctor	100
12. While our physician is arranging our treatment, we should inform the drugs we are currently using	95.1
13. We can stop using the drug when we feel better during the treatment	58.3
14. We can ask our pharmacist where we should store our medicines at home	82.6
15. The duration of treatment for each drug is equal to each other	78.9
16. Herbal products are completely harmless	66.4
17. Medicines can be used in the same amount in all age groups	82.2
18. Using a sufficient number of drugs, not using too many drugs, allows us to heal	90.7
19. More expensive drugs are more effective	75.3
20. Any drug can be used safely during pregnancy	88.7
21. Some drugs are addictive	71.7

RDU: Rational drug use.

Table 3 shows the change in participant scores according to sociodemographic characteristics. There were significant differences between participant scores in terms of gender, age, education level, profession, and distance to a health institution. The scale score of females was higher than that of males ($p<0.01$). The scores of those under the age of 25 were higher than those of the other age groups and those living less than 1 km from the health institution compared to those living farther away ($p<0.05$). Primary school graduates had lower scores than high school and university graduates ($p<0.01$). Among the occupational groups, students and officers had the highest scores, and their scores were significantly higher than workers, self-employed and unemployed. There was no significant difference between participant scores in terms of monthly income, chronic disease status and number of prescriptions written annually (Table 3).

The scale scores of the participants in this study were between 26 and 42 points (mean and standard deviation; 35.73 ± 4.60). In this study, the scale score

of 140 (56.7%) people was 35 points and above, while the score of 107 (43.3%) people was below 35 points.

DISCUSSION

In recent years, IDU has become an important health problem in Türkiye, as it is all over the world, due to the inappropriate prescription, supply, or sale of more than 50% of drugs.¹⁴

The majority of IDUs are polypharmacy, unnecessary and excessive drug use, prescribing that does not comply with clinical guidelines, inappropriate personal treatment and inappropriate selection of new drugs.⁴ IDU brings along many problems such as decreased patient adherence to treatment, drug interactions, resistance to some drugs, recurrence or prolongation of diseases, increased incidence of side effects, and increased treatment costs. RDU is dependent on the rationality of a number of elements, and these elements are the rational choice of drugs, rationality of drug logistics, the rationality of prescribing process, the rationality of prescription re-

TABLE 3: Comparison of the participants' scores from the RDU Scale according to their sociodemographic and background characteristics.

Variables		Scores (Mean±SD)	p value	Post hoc p value
Gender	Female	36.56 ±4.30	0.000 ^{***A}	
	Male	34.15±4.75		
Age	Under 25 years	37.20±.60	0.004 ^{*B}	1-2; p=0.030*
	25-49 years	35.46±4.50		1-3; p=0.006*
	50 years and above	34.22±4.39		
Educational level	Primary school	33.14±4.51	0.000 ^{***B}	1-3;p=0.000**
	Secondary school	35.06±3.39		14; p=0.000**
	High school	36.97±4.30		
	Bachelor and above	37.25±4.82		
Occupation	Housewife	35.70±4.17	0.000 ^{***B}	1-2; p=0.013*
	Student	38.23±4.25		2-3; p=0.000**
	Worker	33.54±4.64		2-5; p=0.000**
	Officer	37.74±4.31		2-7; p=0.001*
	Self-employment	32.07±3.30		3-4; p=0.003*
	Retired	35±5.24		4-5; p=0.002*
	Unemployed	31.66±2.64		4-7; p=0.005*
Monthly income	Under 4,000 TL	36.12±4.66	0.208 ^B	
	4,000-7,999 TL	35.02±4.14		
	8,000 TL and above	35.73±4.60		
Distance to health facility	Less than 1 km	37.07±3.92	0.002 ^{*A}	
	More than 1 km	35.14±4.76		
Chronic disease status	Yes	35.91±5.48	0.719 ^A	
	None	35.67±4.27		
Number of prescriptions written annually	Less than 5	35.96±4.40	0.522 ^B	
	5-9	35.34±4.65		
	10 and above	35.05±5.99		
Total		35.73±4.60		

RDU: Rational drug use; TL: Turkish lira; km: Kilometer; A: Independent samples t-test; B: One-way ANOVA test; *: p<0.05; **: p<0.01.

sponse process, the rational consumption of drugs, the rationality of drug information support and drug management.⁴ In this study, in which the knowledge and attitudes of patients who applied to the oral and maxillofacial surgery clinic of a university were evaluated, it was seen that 43.3% of the participants exhibited an attitude that was not suitable for RDU.

In this study, the statements that the participants agreed with the most were the statements that physicians determined the need for drug treatment (98%) and that only physicians could recommend drugs (99.2%). According to a study conducted in 2014, 39.4% of individuals who applied to the faculty of dentistry stated that they consulted a physician when they were sick the most.¹⁵ In the same year, in a study

conducted in Ankara, Türkiye, 59.5% of individuals stated that they applied to a health institution when they experienced health problems the most.¹⁶ It has been reported that 31.3% of patients who applied to primary health care institutions purchased over-the-counter drugs from pharmacies.¹⁷ It has been reported that 75.5% of outpatients in a hospital in Ankara used self-medication.¹¹ In studies conducted in Nigeria and India on patients who applied to the dentist, the rates of self-use of home remedies for dental problems were reported as 41.5% and 33.3%, respectively.^{18,19} This rate was reported as 21.1% in patients who applied to a dentistry faculty in Türkiye.¹⁵ In a recent study on patients with a history of dental pain in Türkiye, 29.4% of the patients stated that they used

medication for their dental problems without consulting a doctor.²⁰ Self-treatment without consulting a physician can lead to inadequate and incorrect treatment, suppression of symptoms and delay in early diagnosis of the disease, development of harmful drug and food interactions. When the results obtained from this study are compared with the results of previous studies in the literature, it shows that the participants are more conscious about consulting a doctor before drug use. This result may be a positive reflection of the studies regarding RDU carried out in Türkiye for the last 10 years.

In this study, 17.8% of the participants stated that they did not hesitate to recommend medication to their relatives with similar complaints, and this result is similar to previous studies in the literature. In previous similar studies, it was reported that the rate of drug use in individuals with the advice of their environment was 15.8% and 16.2%.^{15,21} In the study conducted by You et al. in Hong Kong, the rate of recommending antibiotics to family members was found to be 8%.²² These findings show that individuals care about the advice they receive from their environment about health.

In this study, all of the participants (100%) stated that they should consult a doctor when undesirable side effects are observed. While 80.6% of the participants in the study stated that drugs can have negative effects as well as positive effects, 24.3% think that all drugs will cause the same side effects. In a similar study conducted by Ekenler and Koçoğlu, it was reported that 76.6% of the participants knew about the side effects of the drugs they used.⁶ Although the participants are aware of the side effects of the drugs they use, it can be said that using drugs without consulting a physician or with the advice of an acquaintance is one of the major obstacles to RDU.

In this study, 82.6% of the participants stated that they could ask their pharmacists how to store their medicines at home. In another study, it was determined that 69.8% of the participants who applied to the family health center paid attention to the storage conditions written in the instructions for use when storing drugs at home. In the same study, it was

determined that the presence of drugs that are not used at home is 85.5%, and the majority of them are painkillers.²³ In another study, it was determined that 93.6% of the participants were able to use the drugs they had stored when they needed them.⁶ In a study conducted with patients who applied to the dentist, it was observed that only 56.3% of the patients paid attention to the fact that the expiration date was not expired when reusing the leftover drugs at home.¹⁵ It is inconsistent with the principles of RDU for individuals to keep drugs at home, not pay attention to drug storage conditions, and use drugs that are not stored under appropriate conditions in this way.

The use of drugs without consulting a physician is one of the most common examples of IDU. In previous studies, the rate of those who stated that they used drugs without the advice of a physician was found to be 62% and 76.4%.^{16,23} In the study of Ouédraogo et al. on individuals with a certain health problem, it was observed that approximately three-quarters of individuals had a habit of using drugs on their own.^{24,25} In a study conducted in 2016, it was determined that 71.3% of individuals used pain relievers and 29.6% used antibiotics without consulting a physician.²³ These findings show that most of the participants use painkillers without consulting a physician. It is thought that this is due to the fact that painkillers are available without a prescription, their side effects are thought to be lower, and their prices are affordable.²⁵ It is thought that the fact that antibiotics cannot be taken without a prescription and public service announcements have an effect on the lower use of antibiotics compared to other types of drugs without consulting a physician. Individuals tend to use drugs without consulting a physician, due to reasons such as easy access to drugs, drug prices, not being able to spare time for healthcare institutions due to time, cost and inadequacy in healthcare services, etc.²⁶ The high rate of self-use of drugs by individuals may cause a series of problems such as missed early diagnosis and treatment opportunities, the development of antibiotic resistance, and the emergence of drug side effects.

It is important to use the drugs as recommended by the physician and pharmacist in order to see the desired effect. In this study, 41.7% of the participants

stated that they could stop using the drug when they felt better. In the study of Yapıcı et al., it was determined that 43.7% of the participants stopped using the drug before the time recommended by the physician.¹⁷ In the study of Koyuncuoğlu et al., it was stated that only 42% of the participants used the medicine prescribed by the physician for the period recommended by the physician and pharmacist.¹⁰ In a study conducted in Türkiye on patients with a history of dental pain, 70.3% of individuals stated that they used the drugs for the period recommended by the physician and pharmacist. In this study, it was determined that patients were more likely to comply with the recommendations of the physician and pharmacist in the use of drugs for dental reasons.²⁰ The most important reason for stopping using medication before the recommended time is that individuals believe they have recovered.²¹ In Peche's study with 5,379 participants from 9 countries, including Türkiye, 87% of the participants reported that they discontinued their medication if they felt better.^{27,28} Cessation of drug use before the time recommended by the physician may cause a relapse of the disease, development of drug resistance, and unnecessary reuse of health services.²⁵

Not taking the medicine at the time intervals determined by the doctor or pharmacist, and changing the dose of the medicine without consulting their doctor are other IDU examples that are common. In this study, 72.9% of the participants stated that taking the drug more frequently at the time intervals specified by the doctor may be harmful, while 68% stated that not using the drug during the treatment period specified by the doctor may prevent recovery. In another study, it was determined that 9.7% of the participants were able to change the drug dose without consulting a physician.¹⁷ The reasons for the participants to change the drug dose were determined as the side effects of the drugs, the thought that the drugs did not work, forgetting to take the drug, and boredom.¹⁷ According to the research conducted by Ekenler and Koçoğlu, it was determined that 15.6% of the participants did not use their medicines at the time recommended by the physician.^{23,28} The most important reason for not using the drug at the time recommended by the physician was determined to be forgetting the use of the drug.²³

Today, the fact that the treatment with herbal methods is frequently on the agenda in the mass media directs individuals to these applications and the use of these applications is increasing.¹⁵ While the rate of use of herbs and herbal tea for treatment in addition to the use of drugs in patients applying to a faculty of dentistry was 64.8% in the study of Yılmaz et al.,¹⁵ this rate was reported as 15.7% in the study of Koyuncuoğlu et al.¹⁰ In this study, 61.9% of the participants thought that herbal products could not be used instead of drugs, and 66.4% thought that herbal products were not completely harmless. In another similar study, 40.6% of the participants stated that they used non-drug methods to relieve toothache.²⁰ Herbal treatment applications together with the drugs recommended by the physician can change the course and effectiveness of the treatment. When there is insufficient knowledge about the amount of application, the way of preparation and how it interacts with food, herbal treatment may also cause side effects. Therefore, it is necessary to provide accurate information on this subject in mass media.¹⁵

In this study, the scale score of those whose home is less than 1 km from the health institution was found to be significantly higher than the others, similar to the results of a previous study.¹³ This result may be due to the possibility of those living close to the health institution having more accurate information by interacting more with physicians, pharmacists, and other health personnel. Because these individuals will have more opportunities to consult a physician about using drugs when they get sick or feel bad.

In this study, it was seen that young people under the age of 25 and women were more knowledgeable than others about RDU. The fact that the scores of primary school graduates are significantly lower than the other groups, and the scale scores of students and officers are higher than other occupational groups show the effect of education on RDU. Undoubtedly, education is one of the first steps to be taken to promote RDU. This can be possible through individual training such as informing by physicians and pharmacists, as well as formal and non-formal education activities at the national level. Awareness of RDU should be created in society through all

media tools such as public spots and posters to be hung in health institutions.

The results of the study cannot be generalized to the whole population, since the results of the study are limited to the sample group in which it was conducted. Although the sample size is relatively small, this study is the first to evaluate the knowledge and attitudes of maxillofacial surgery patients about RDU.

CONCLUSION

Although significant progress has been made toward RDU in Türkiye in recent years, this study revealed that individuals need training on some issues related to RDU. Especially it has emerged that the participants should be informed about some issues such as using a drug for as long as the doctor recommends, and using herbal medicines correctly. Individuals should be more informed by dentists and pharmacists about using drugs correctly. In addition, knowing that

it will be difficult and time-consuming to change the wrong habits established in individuals, an effective and continuous education activity should be carried out at the national level by using non-formal and formal education opportunities.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

This study is entirely author's own work and no other author contribution.

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