DOI: 10.24938/kutfd.1313973 Kırıkkale Üniversitesi Tıp Fakültesi Dergisi 2023;25(3):400-407
Original Article *Özgün Araştırma*

YOUTUBE™ QUALITY AS A RESOURCE ON RATIONAL USE OF ANTIBIOTICS IN THE COMMUNITY: A REMEDIAL APPROACH TO ANTIMICROBIAL MANAGEMENT

Toplumda Akılcı Antibiyotik Kullanımı Hakkında Bir Kaynak Olarak Youtube™ Kalitesi: Antimikrobiyal Yönetimine İyileştirici Bir Yaklaşım

Sema KETENCİ[1] Nazife Gökçe AKPINAR[2]

[1] *Department of Pharmacology, Faculty of Medicine, Atlas University, İSTANBUL, TÜRKİYE*
[2] *Türkiye Ministry of Health Gebze Number 1 Family Health Center, KOCAELİ, TÜRKİYE*

ABSTRACT

Objective: Infections for which antibiotics were influential in the past, cannot be adequately treated today and the evolution of microorganisms with multiple antibiotic resistance is due to the irrational use of antibiotics. The study aims to help develop effective drug information systems for rational antibiotic use and enable patients to make informed treatment decisions.

Material and Methods: A search of YouTube™ was performed using the three keywords 'correct antibiotic use', 'wrong antibiotic use', and 'antibiotic resistance'. Video lengths, dates of upload, numbers of total views, likes, dislikes, and comments were collected. The study viewed and analyzed the top 90 directly relevant videos for each of our search terms. Two pharmacologists independently evaluated the videos. For each video viewed, the following information was analyzed: the video's title, the date it was uploaded, the source and location of the video, the number of views the video has received overall, its duration, the number of likes and dislikes, and the number of comments.

Results: 90 of the top 422 videos from the YouTube™ search results after evaluation were added to the study for additional examination. The mean DISCERN and JAMA scores were 46.42±10.91 and 2.29±0.58, respectively. There was a high correlation between the videos evaluated according to DISCERN and JAMA scales.

Conclusion: YouTube™ videos can be used as a valuable source for rational antibiotic use. This inclusion of antimicrobial resistance topics in social media could be a cornerstone in the worldwide fight against antimicrobial resistance if tested extensively in field conditions and used in the public interest on a larger scale.

Keywords: *Drug resistance, microbial, antimicrobial drug resistance, drug use*

ÖZ

Amaç: Antibiyotik kullanımı enfeksiyon hastalıklarının tedavisinde devrim niteliğinde bir dönüşüm oluştursa da hastalıklardaki artışa paralel olarak uygunsuz ve akılcı olmayan kullanım sonucu antimikrobiyal direnç sorununu da beraberinde getirmiştir. Çalışma, akılcı antibiyotik kullanımı için etkili ilaç bilgi sistemlerinin geliştirilmesine yardımcı olmayı ve hastaların bilinçli tedavi kararları vermesini sağlamayı amaçlamaktadır.

Gereç ve Yöntemler: "Doğru antibiyotik kullanımı", "Yanlış antibiyotik kullanımı" ve "Antibiyotik direnci" üç anahtar kelime kullanılarak bir YouTube™ araması yapıldı. Video uzunlukları, yükleme tarihleri, toplam görüntüleme sayıları, beğeniler, beğenmemeler ve yorumlar toplandı. Çalışma, arama terimlerimizin her biri için doğrudan alakalı en iyi 90 videoyu inceledi ve analiz etti. Video bağlantıları daha sonra analiz edilmek üzere kaydedildi. Videolar, altyazısız, İngilizce dilinde, müzik ya da anime hayvan gibi görüntüler içermeyen videolar arasından seçilmiştir. Bununla birlikte tüm seçilen videoların, halkı doğru bilinçlendiren ve reklam amaçlı bilgiler içermeyen videolar olmasına öze gösterildi. İki farmakolog bağımsız olarak videoları değerlendirdi. Görüntülenen her video için şu bilgiler analiz edildi: videonun başlığı, yüklendiği tarih, videonun kaynağı ve konumu, videonun toplam izlenme sayısı, süresi, beğeni ve beğenmeme sayısı ve yorum sayısı DSÖ (Dünya Sağlık Örgütü) kılavuzu tarafından hazırlanan 10 soru, seçilen videolardaki tıbbi bilgileri değerlendirmek için kullanılan en kaliteli DISCERN ve JAMA ölçekleri kullanılarak puanlandı.

Bulgular: Değerlendirme sonrası YouTube arama sonuçlarında en çok görüntülenen 422 videodan 90 tanesi inceleme için çalışmaya eklendi. Ortalama etkileşim oranı 0.58 idi. Ortalama DISCERN ve JAMA puanları sırasıyla 46.42±10.91 ve 2.29±0.58 idi. DISCERN ve JAMA ölçeklerine göre değerlendirilen videolar arasında yüksek korelasyon vardı.

Sonuç: YouTube™ videoları, akılcı antibiyotik kullanımı için yararlı bir kaynak olarak kullanılabilir. Antimikrobiyal direnç konularının sosyal medyada bu şekilde yer alması, saha koşullarında kapsamlı bir şekilde test edilmesi ve daha geniş ölçekte kamu yararına kullanılması halinde antimikrobiyal dirence karşı dünya çapında mücadelede bir mihenk taşı olabilir.

Anahtar Kelimeler: *İlaç direnci, mikrobiyal, antimikrobiyal ilaç direnci, ilaç kullanımı.*

Correspondence / Yazışma Adresi: **Dr. Sema KETENCİ**
Department of Pharmacology, Faculty of Medicine, Atlas University, İSTANBUL, TÜRKİYE
Phone / Tel: +905418344034 **E-mail** / E-posta: sema.ketenci@atlas.edu.tr
Received / Geliş Tarihi: 13.06.2023 **Accepted** / Kabul Tarihi: 11.08.2023

KÜ Tıp Fak Derg 2023;25(3):400-407
Doi: 10.24938/kutfd.1313973

INTRODUCTION

A drug is described as "a substance or product used or intended to be utilized to modify or assess physiological systems or pathological situations for the benefit of the recipient" by the World Health Organization (WHO) (1). WHO drew attention to the Rational Use of Medicines (RDU) studies for the first time in 1985. It defined RDU as a set of rules that require patients to take medication according to their clinical needs, at a dose and timeframe sufficient to meet their personal needs, at the lowest cost to themselves and society. However, it has been reported that more than half of drugs worldwide are inappropriately prescribed, prepared, sold and misused by patients (1-4). In addition to being beneficial for human health by treating diseases when used correctly, the drug has an important place in human and public health because it is a substance that can create life risks when used incorrectly (5). Giving information about their treatment by allocating enough time for the patients, eliminates the negative habits about drugs. Eliminating the lack of knowledge contributes to the correct use of drugs (6,7). Rational Use of Medicines practice consists of planning, execution and monitoring procedures that ensure the effective, safe and economical use of drugs. For this process to work properly, it requires raising awareness of the pharmaceutical industry, healthcare professionals, especially physicians and pharmacists, and society, under the control of the state (8). The main principle in RDU; is the necessity of using the medicine rationally and correctly, at the right time, in the required quality, in the required dose, according to the condition of the disease and the patient (9). Irrational drug use is an important health problem that brings an economic burden to society and the patient as a result of bacterial resistance to antibiotics, ineffective treatment and drug side effects (10). The main problems generally identified in research on irrational drug use include overprescribing drugs, misuse of drugs, unnecessary use of expensive drugs, unnecessary consumption of antibiotics, or recommending unnecessary injections (11). Studies have shown that people are mostly in the habit of taking medications such as painkillers and antibiotics at home (12-14). Antibiotics are either used in off-label viral diseases or unconsciously used at inappropriate times and doses. As a result, the development of resistance to antibiotics is induced in microorganisms (15). Inappropriate use of antimicrobials can be summarized as taking insufficient doses for non-bacterial infections, excessive use of injections rather than oral formulations, and non-prescription according to clinical guidelines. Self-medication and off-dosage regimen practices, which generally deviate from the prescription drug package insert lead to overuse of antibiotics. RDU covers many stages from drug production, distribution, prescription and disposal. When evaluated from this point of view, many methods can be a solution to the mistakes made in the use of drugs. The most important of these, are educational activities. Both health workers and the public need to be aware of this issue. Another method to be implemented involves information campaigns and promotional activities with the main purpose of raising awareness. Developed countries follow programs such as follow-up, which includes basic protocols for medical management and guidelines for prescribing, to prevent the irrational use of antibiotics (16-19). Compliance with the guidelines developed for rational antibiotic use prevents excessive antibiotic consumption (20-22). Ineffective and irrational drug use is a serious problem and has an important place in health expenditures all over the world. People across the world have a propensity to self-medicating and suggest to one another. Antibiotic overuse and misuse can result in the development of bacterial resistance and raise the cost of healthcare services. Additionally, a variety of pharmacological side effects are seen (23,24). Irrational antibiotic use is a common problem in Turkey. Surveillance studies found that between 40 and 60% of antibiotics were used inappropriately (25-27).

The present research examined YouTube videos on careful antibiotic usage for public health to determine their use and potential efficacy as a public education tool.

KÜ Tıp Fak Derg 2023;25(3):400-407
Doi: 10.24938/kutfd.1313973

MATERIALS AND METHODS

The video searching was performed using the search terms "correct antibiotic use," "wrong antibiotic use," and "antibiotic resistance," in order to find the videos pertinent to educating the general public about rational antibiotic use on YouTube on August 24, 2022 (www.youtube.com); which resulted in a total of 422 videos. According to research, most studies that utilize YouTube as a search engine, are watched in the top 60-200 videos and first for search phrases, and 95% of users who search YouTube online only watch the 60 videos that come initially during a search (28). Therefore, we watched and analyzed the first 90 videos directly related to the topic for each of our search terms. Video links were recorded for later analysis. The videos were screened to exclude those that were not in English, lacked subtitles and headings, were not medically related, duplicated, contained agricultural or animal antibiotics, were music videos or otherwise not intended to educate the general public, were commercials, lacked information, or were shorter than five minutes. Two pharmacologists (S.K. and G.A.) independently evaluated the videos. DISCERN and JAMA scores were averaged for the two investigators' divergent assessments. For each video, the following information was analyzed: The video's title, the date it was uploaded, the source and location of the video, the number of views the video has received overall, its duration, the number of likes and dislikes, and the number of comments. Health universities or health professional organizations, TV stations or news organizations, health information websites, and individual users with a medical identity were all classified as download sources. The 10 questions prepared by the WHO drugs evaluation indicator guide were scored using the highest quality DISCERN and JAMA scales, which are used to evaluate the medical information in selected videos. The DISCERN scoring system consists of 16 questions (29-31). Each question should be scored between 1-5, within the scores of 16-75. There are three sections to measure treatment information, reliability, and general information quality. A higher score on the scale indicates higher information quality. The scores were classified as 'excellent' and 'good', between 75 and 63 points, “very good” between 51-62 points, “moderate” between 39-50 points, “weak” between 28-38 points, and “very weak” below 28 points are (30).

The JAMA rating system is one of the top scales for assessing medical information. Each of the 4 different criteria in each question is worth 1 point. The highest quality is indicated with a score of 4 (31).

In addition, the popularity of the videos was calculated one by one using the formula 'Video Power Index (VPI): (Likes-Dislikes) x100/Total views (32).

According to the WHO recommendation, the usefulness of each film in educating the public about ethical antibiotic use practices was evaluated on a scale of 0 to 10 (Table 1). Videos rated 0 as not helpful, 1 to 3 rated as less valuable, 4-7 rated videos as 'moderately useful', and 8-10 rated as very useful. When researchers disagreed on how to categorize or score videos, they discussed the matter until they agreed by reading the relevant guidelines and literature. This research does not include human subjects, human material, or human data. The study is exempt from ethical approval as it is observational and uses publicly available data.

The videos that did not meet the exclusion factors were included in the study. Attention should be paid to the choice of keywords to ensure that the community can access information on correct and rational drug use while avoiding incorrect content. In addition, content published for advertising purposes and not prepared by health professionals, and videos that may be found too long and boring for the audience were excluded because they did not serve the purpose.

KÜ Tıp Fak Derg 2023;25(3):400-407
Doi: 10.24938/kutfd.1313973

Table 1: Usefulness score used to evaluate videos.

Questions	Score
Antibiotics are not used in the treatment of diseases of viral origin. Does it state that antibiotics are used for the treatment of bacterial diseases?	1
Are antibiotics said to be of no use in non-microbial diseases?	1
It is said that antibiotics are not used for pain relief or fever reduction.	1
Is it given that only the physician can recommend the antibiotic and that it is undesirable to use the antibiotic for longer than the recommended time as well as to stop it before the time recommended by the physician?	1
Is it shared that the wrong use of antibiotics outside of the doctor's control or recommendation may cause the existing disease not to improve or worsen?	1
Is it said that unconscious use of antibiotics, such as self-medication, can lead to treatment failure called antibiotic resistance, and that additional health problems may arise, as well as diseases that do not get better?	1
Does the video encourage rational drug use? Will this publication affect the consumer positively?	1
Is it stated by whom the publications were made? Is it reliable (Ministry of Health, the pharmaceutical company?) Does it comply with legislation and guidelines?	1
Is it said that medicines should only be obtained from pharmacies?	1
Are there health professionals in the content of the broadcast?	1
Total Score 0= not useful; scores 1–3 = slightly useful; scores 4–7 = moderately useful; scores 8–10 = very useful.	

Statistical analysis

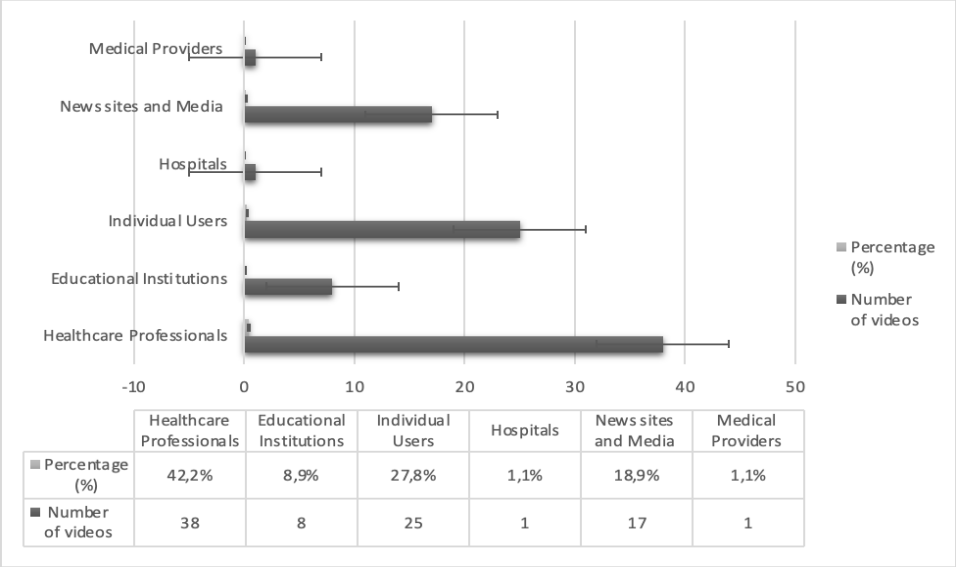
All statistical analyses in the study were performed using IBM SPSS Statistics version 20 (SPSS Inc., Chicago, IL, USA). The continuity of the variables was examined using the Kolmogorov-Smirnov and Shapiro-Wilk tests. Mann-Whitney U and Kruskal-Wallis analyzes were used to compare more than two groups that did not show normal distribution. Multiple regression analysis was performed to measure independent variables. Results were considered statistically significant when the p-value was less than 0.05.

RESULTS

After evaluation, 90 of the top 422 videos from the YouTube search results were added to the study for additional examination. Most of the excluded videos were non-medical content 242 (73%), ads 12 (3.7%), videos without any information 33 (10%), commercial for-profit companies 17 (5.3%), non-English videos, 7 (2.1%), and videos shorter than 5 minutes 19 (5.9%) were also excluded. Healthcare professionals contributed a significant percentage (42.2%) of the videos, while individual users uploaded 27.8% of them. Of the remaining videos 8.9% were uploaded by educational institutions, 1.1% by hospitals, 18.9% by news outlets and media featuring healthcare professionals, and 1.1% by medical providers (Figure 1). The average length of the videos was 2.04±1.3 minutes. The average number of views of the videos was 41.934±14.9206. The average viewing rate was 1024.12. The mean interaction rate was 0.58 (ranging from 0.53 to 24.12). The mean DISCERN and JAMA scores were 46.42±10.91 and 2.29±0.58, respectively. There was a high correlation between the videos evaluated according to DISCERN and JAMA scales ($r=0.612$, $p<0.001$). According to the average DISCERN scores, the quality of the videos was determined to be extremely poor at 2%, poor at 15%, fair at 68%, good at 11% and exceptional at 4%. In 18% of the movies, the average JAMA score was 2, in 65%, it was between 2 and 3, and in 17% it was over 3 (Figure 2). Many of the videos (51.1%) were rated as being just slightly beneficial overall by the JAMA scale. While 25 videos (27.8%) found it useful, 3 videos (3.3%) were very useful, and 16 videos (17.8%) did not provide useful information. The most watched video was a healthcare institution video that lasted 0.15 seconds and

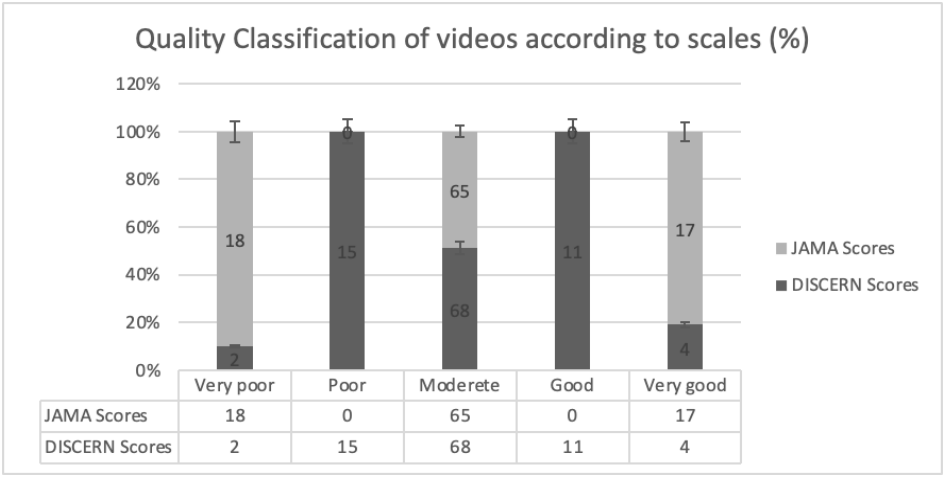
KÜ Tıp Fak Derg 2023;25(3):400-407
Doi: 10.24938/kutfd.1313973

was watched nearly 1 million times in three years, describing the misuse of antibiotics. No significant correlation was found between the number of views and VPI scores (p=0.698), engagement rate (p=0.247) and viewing rate (p=0.771). However, no relationship was found between the video source and the number of views (p=0.465), view rate (p=0.286), or engagement rate (p=0.521). No statistically significant correlation was found between VPI scores and DISCERN or JAMA scaling scores (p>0.05). Considering the video length (video duration), there was a statistically significant correlation between both DISCERN scores (r=0.533, p<0.001) and JAMA scores (r=0.542, p<0.001).



	Healthcare Professionals	Educational Institutions	Individual Users	Hospitals	News sites and Media	Medical Providers
Percentage (%)	42,2%	8,9%	27,8%	1,1%	18,9%	1,1%
Number of videos	38	8	25	1	17	1

Figure 1: Source of upload of videos



	Very poor	Poor	Moderete	Good	Very good
JAMA Scores	18	0	65	0	17
DISCERN Scores	2	15	68	11	4

Figure 2: Videos evaluated according to DISCERN and JAMA scales

DISCUSSION

The internet, which has entered our daily lives, maintains its feature of being a useful information and communication source that is of great interest (33). According to surveys found in prior studies, patients rely on health data obtained from internet-based sources (34). Considering all these data, YouTube is an important platform as a potential source of information. However, it has the disadvantage that the reliability of the information given is questionable. Misleading videos can be uploaded to this platform from many professions or individually on any subject. As a result, medical information on the internet must be trustworthy. Studies published in the literature to date have evaluated

KÜ Tıp Fak Derg 2023;25(3):400-407
Doi: 10.24938/kutfd.1313973

the quality and accuracy of videos on the internet using some scoring systems to ensure information reliability (30,31,35). According to the literature, this study is the first to examine the accuracy and informational value of YouTube videos about appropriate drug use. Our study is significant for public health because it is the first in the literature to examine the information content and validity of videos published on YouTube about rational drug use, even though many scoring systems are used to assess the quality and accuracy of videos on the internet. In this study, it was investigated whether the information found in YouTube videos varied in terms of quality, dependability, and validity depending on the video's source. Most of the drug usage films on YouTube were of mediocre quality. Videos from the health channels were noticeably better quality than other videos. Our working premise was that reputable organizations would pioneer high-quality videos and produce YouTube videos with a medical theme for the general audience. However, only 31.1% of the videos had a very broad educational scope. Most YouTube users watched medium-quality videos provided by individual and media websites and left a few comments. The VPI of videos originating from news channels and media did not correlate with DISCERN or JAMA scores. Studies have reported that the higher the video quality, the shorter the video duration (36,37). Although there are studies that weakly correlate video quality with video length, our study found no association between video durations and VPI or video ratio. Videos in which information is told in the form of stories attract more viewers. In our study, there was a strong link between DISCERN scores and movie length. The most popular scales in the literature JAMA and DISCERN were used to evaluate YouTube videos about prudent antibiotic usage, and the analyzed films displayed a substantial correlation with both scales. The mean DISCERN score of the videos was 46.42±10.91 and the JAMA score was 2.29±0.58 out of 4.0. These average values are close to our expectations. Considering the distribution of the quality of the videos according to the DISCERN scoring system, only 11% got 'good' and 68% got a 'medium' score. It was interesting to see that, on both measures, the quality of the videos uploaded from health channels was superior to that of other significant news channels. While the healthcare practitioner or organization should be concerned about the lack of a connection between the public's response to videos and the caliber of the films, the research's findings provide some insight into the value of education on social media.

In the long term, increased usage of social media provides an opportunity to raise awareness about the prevention of disease, rational antibiotic use, and antibiotic resistance through various online movies, games, and photographs. The study's weakness is that the search terms employed can influence the recovery of relevant data. The content of YouTube videos changes almost every second, leading to an increase in content. Because the sensitivity and specificity of the results may vary depending on the time frame examined. Finally, it should be noted that antibiotic resistance is a serious issue and an unavoidable fact. Videos on YouTube might be a good resource for logical antibiotic usage. Public health and pharmacology experts must raise the standard of instruction they offer. For this reason, the only way to prolong the life of patients in need of antibiotics without developing resistance to antibiotics is to use them rationally, in line with appropriate guidelines, by providing reliable and sufficient information flow for the public.

*Conflict of interest***:** The authors have no conflicts of interest to declare.

Researchers' Contribution Rate Statement: Concept/Design:SK; Analysis/Interpretation;SK, NGA; Data Collection:SK; Writer:SK; Critical Review:SK, NGA; Approver:SK

Support and Acknowledgment: No financial support was received from any institution or person..

*Ethics committee approval***:** This research does not include human subjects, human material, or human data. The study is exempt from ethical approval as it is observational and uses publicly available data.

KÜ Tıp Fak Derg 2023;25(3):400-407
Doi: 10.24938/kutfd.1313973

REFERENCES

1. World Health Organization (WHO). Promoting Rational Use of Medicines: Core Components. WHO Policy Perspectives on Medicines, Geneva, 2002: http://apps.who.int/medicinedocs/pdf/h3011e/h3011e.pdf.
2. Le Grand A, Hogerzeil HV, Haajier Ruscamp FM. Intervention research in rational use of drugs: A review. Health Policy Plan. 1999;14(2):89-102.
3. Promoting rational drug use. Trainer's guide. Accra, Ghana, 1998;15-27. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://apps.who.int/iris/bitstream/10665/67438/1/WHO_EDM_2002.3.pdf
4. Almarsdottir AB, Traulsen JM. Rational use of medicines - an important issue in pharmaceutical policy. Pharm World Sci. 2005;27(2):76-80.
5. Phillips DP, Breder CC. Morbidity and mortality from medical errors: An increasingly serious public health problem. Annu Rev Public Health. 2002;23(1):135-50.
6. Guide to good prescribing. WHO/Action programme on essential drugs, Geneva, 1994. http://apps.who.int/medicinedocs/pdf/whozip23e/whozip23e.pdf.
7. Holloway K, van Dijk L. The World Medicines Situation 2011-Rational Use of Medicines. WHO, Geneva, 2011: http://apps.who.int/medicinedocs/documents/s18064en/s18064en.pdf
8. Özçelikay G. A pilot study on rational drug use. J Fac Pharm, Ankara, 2001;30(2):9-18.
9. Mascia MF, Koch M, Medicis JJ. Pharmacoeconomic impact of rational use guidelines on the provision of analgesia, sedation, and neuromuscular blockade in critical care. Crit Care Med. 2000;28(7):2300-6.
10. Siddiqi S, Hamid S, Rafique G, Chaudhry SA, Ali N, Shahab S, et al. Prescription practices of public and private health care providers in the Attock district of Pakistan. Int J Health Plan and Manage. 2002;17(1):23-40.
11. WHO / DAP: Injection Use and Practices in Uganda. Geneva: DAP. 1994. https://apps.who.int/iris/handle/10665/59735?show=full.
12. Wondimu A, Molla F, Demeke B, et al. Household storage of medicines and associated factors in Tigray Region, Northern Ethiopia. PloS One. 2015;10(8):e0135650.
13. Jassim AM. In-home drug storage and self-medication with antimicrobial drugs in Basrah, Iraq. Oman Med J. 2010;25(2):79-87.
14. Ayele Y, Mamu M. Assessment of knowledge, attitude and practice towards disposal of unused and expired pharmaceuticals among the community in Harar city, Eastern Ethiopia. J Pharm Policy Pract. 2018;15(11):1-7.
15. Basaran NF, Akici A. Patients' experience and perspectives on the rational use of drugs in Turkey: A survey study. Patient Prefer Adherence. 2012;6(1):719-24.
16. Kunin CM. Problems of antibiotic usage; definitions, causes, and proposed solutions. Ann Intern Med. 1978;89(5Pt2Suppl):802-5.
17. Smith JW, Jones SR. An educational program for the rational use of antimicrobial agents. South Med J. 1977;70(2):215-8.
18. Couper MR. Strategies for the rational use of antimicrobials. Clin Infect Dis. 1997;24(1):154-6.
19. Guglielmo BJ. Practical strategies for the appropriate use of antimicrobials. Pharm World Sci. 1995;17(4):96-102.
20. Moellering RC. Principles of anti-infective therapy. In: Mandell GL, Bennett JE, Dolin R, editors. Principles and practice of infectious disease. New York, Churchill Livingstone, 1995;10(5):303–4.
21. Beam TR Jr, Gilbert DN, Kunin CM. General guidelines for the clinical evaluation of anti-infective drug products. Clin Infect Dis. 1992;15(1):5-32.
22. Roberts AW, Visconti JA. The rational and irrational use of systemic antimicrobial drugs. Am J Hosp Pharm. 1972;29(10):828-34.

KÜ Tıp Fak Derg 2023;25(3):400-407
Doi: 10.24938/kutfd.1313973

23. Gyssens IC. Quality measures of antimicrobial drug use. Int J Antimicrob Agents. 2001;17(1):9-19.
24. Hart CA, Kariuki S. Antimicrobial resistance in developing countries. BMJ. 1998;317(7159):647-50.
25. Erbay A, Colpan A, Bodur H, Cevik MA, Samore MH, Ergonul O. Evaluation of antibiotic use in a hospital with an antibiotic restriction policy. Int J Antimicrob Agents. 2003;21(4):308-12.
26. Buke C, Hosgor-Limoncu M, Ermertcan S, Ciceklioglu M, Tuncel M, Kose T, Eren S. Irrational use of antibiotics among university students. J Infect. 2005;51(2):135-9.
27. Ozkurt Z, Erol S, Kadanalı A, Ertek M, Ozden K, Tasyaran MA. Changes in antibiotic use, cost and consumption after an antibiotic restriction policy applied by infectious disease specialists. Jpn J Infect Dis. 2005;58(6):338-43.
28. Desai T, Shariff A, Dhingra V, Minhas D, Eure M, Kats M. Is content king? An objective analysis of the public's response to medical videos on YouTube. PLoS One. 2013;18(8):e82469.
29. Organization WH. Using indicators to measure country pharmaceutical situations: Fact book on WHO Level I and Level II monitoring indicators. Using indicators to measure country pharmaceutical situations: Fact book on WHO Level I and Level II monitoring indicators. 2006:xviii, 84–xviii: https://iris.who.int/handle/10665/354554
30. Gokcen HB, Gumussuyu G. A quality analysis of disc herniation videos on YouTube. World Neurosurg. 2019;124(1):799-804.
31. Silberg WM, Lundberg GD, Musacchio RA. Assessing, controlling, and assuring the quality of medical information on the internet: Caveat lector et view or let the reader and viewer beware. JAMA. 1997;277(15):1244-5.
32. Duman C. YouTube™ quality as a source for parent education about the oral hygiene of children.Intern J Dental Hygiene. 2020;18(3):261-7.
33. Hassona Y, Taimeh D, Marahleh A, Scully C. YouTube as a source of information on the mouth (oral) cancer. Oral Dis. 2016;22(3):202-8.
34. Carlsson M. Cancer patients seeking information from sources outside the health care system. Support Care Cancer. 2000;8(6):453-7.
35. Madathil KC, Rivera Rodriguez AJ, Greenstein JS, Gramopadhye AK. Healthcare information on YouTube: A systematic review. Health Informatics J. 2015;21(3):173-94.
36. Conti P, D'Ovidio C, Conti C, Gallenga CE, Lauritano D, Caraffa A, et al. Progression in migraine: Role of mast cells and pro-inflammatory and anti-inflammatory cytokines. Eur J Pharmacol. 2019;844(1):87-94.
37. Lechien JR, Chiesa-Estomba CM, De Siati DR, Horoi M, Le Bon SD, Rodriguez A, et al. Olfactory and gustatory dysfunctions as a clinical presentation of mild-to-moderate forms of the coronavirus disease (COVID-19): A multicenter European study. Eur Arch Otorhinolaryngol. 2020;277(8):2251-61.