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Improving patient knowledge on rational use of antibiotics using educational videos

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Article Info	ABSTRACT
	Providing proper knowledge on the rational use of antibiotics plays a role in the success of the treatment process of infectious diseases and the prevention of antibiotic resistance. In this modern digital era, healthcare professionals can utilize video as a medium for patient education. This study was meant to determine the efficacy of a video-based educational intervention in improving the levels of knowledge on the rational use of antibiotics. The study used a quasi-experimental pretest-posttest with a control group design and involved 140 participants. Data collection utilized a questionnaire that was carried out from July to December 2021 at the Special Region of Yogyakarta, Indonesia. The intervention was conducted for four weeks with a lecture and group discussion using video as educational media. The results of this study found that educational videos significantly improved the levels of knowledge on the rational use of antibiotics, known by an increase in the mean value of the treatment group by 2.590 with a p-value of 0.001, and a difference in the mean value of posttest scores of both groups by 1.900 with a p-value of 0.001. It could be concluded that video could be utilized as an effective medium of patient education, notably the use of antibiotics.

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1. INTRODUCTION

Infectious diseases are still one of the most essential healthcare problems in society, especially in developing countries. To address the problem, antibiotics are one of the popular drugs that are often prescribed by doctors. These drugs are chemical substances produced by microorganisms and have the ability to inhibit growth or kill microorganisms. Due to their effects, antibiotics were considered able to provide benefits. However, if used inappropriately, they can cause antibiotic resistance that can lead to a global threat, especially in the healthcare sector. Previous studies concluded that 40–62% of antibiotics were used inappropriately, including for infectious diseases that did not require antibiotic treatment [1], [2]. The World Health Organization (WHO) stated that the number of deaths due to antibiotic resistance was 700,000 people each year in 2014. It also predicted that 10 million people die due to resistance by the year 2050 [3].

One of the main causes of antibiotic resistance is a lack of knowledge on the proper use of antibiotics. Generally, patients and the publics get information on the rational and proper use of drugs, including antibiotics, from healthcare professionals, such as doctors and pharmacists. Proper information by professionals is highly required to improve the levels of medication adherence as inappropriate information will provide misleading information to the patients and lead to poor medication adherence [4]. In the

provision of drug information, the role of pharmacists is the primary concern as responsible for the practice of pharmaceutical services [5].

Providing proper knowledge on the rational use of antibiotics plays a role in the success of the treatment process of infectious diseases, in addition to the prevention of antibiotic resistance. To minimize the resistance, healthcare professionals can educate patients and the publics through various educational media. In this digital era, video and other multimedia formats, i.e., digital infographics and apps, were useful as an alternative and attractive educational medium. These digital things function as a medium for health education, consultation, and dissemination of health information [6].

Both patients and the public have the right to get the knowledge on the proper use of drugs, including antibiotics, so the government and healthcare professionals should be serious in dealing with the problem of antibiotic adherence to prevent resistance. Unfortunately, a previous study reported that most patients lack information regarding the use of the drug, notably antibiotics [7]. Therefore, to address this matter, providing an attractive learning medium is a good deal [8], [9], one of which is video [10], [11]. This study mainly aimed to determine the efficacy of a video-based educational intervention in improving the levels of knowledge on the rational use of antibiotics.

2. RESEARCH METHOD

This study applied a quasi-experimental pretest-posttest with control group design. It was carried out from July to December 2021 at the Special Region of Yogyakarta, Indonesia. The study hypothesized that video-based educational intervention significantly helped improve the levels of knowledge on the rational use of antibiotics. To prove the hypothesis, the assessment utilized an instrument in the form of a questionnaire.

2.1. Population and samples

The recruitment process of participants involved in this study implemented a quota sampling method with the inclusion criteria, such as people who have taken antibiotics, aged over 17 years old, willing to sign the informed consent form, and willing to answer the questionnaire, while exclusion criteria included those who did not completely fulfill the questionnaire and whose background was in healthcare sciences. The sample calculation of this study, as the population of antibiotic users was unknown clearly, used a formula developed by Lemeshow and Lwanga [12]. The calculation resulted in 140 study participants which were further divided into two groups, i.e., control and treatment.

2.2. Instrument

The instruments of this study were educational videos on the rational use of antibiotics and a questionnaire on the patient's knowledge and perception of antibiotic use and microbial resistance. The educational videos were created following the guideline of Smart Society Movement on Using Drugs/*Gerakan Masyarakat Cerdas Menggunakan Obat* (Gema Cermat), by the Ministry of Health of the Republic of Indonesia. Meanwhile, the questionnaire was developed by Larasari *et al.* and was published in the previous studies [13], [14].

The levels of knowledge on the rational use of antibiotics among study participants were determined using a questionnaire consisting of 14 question items measured by a Guttman scale (Yes or No). Specifically, the questionnaire has seven questions related to knowledge of drug use, (numbers 1, 2, 3, 10, 11, 12, and 13), while the other seven questions were the rationality of antibiotic use behavior, (numbers 4, 5, 6, 7, 8, 9, and 14). The score of the questionnaire was: i) 1 for the correct answer; ii) 0 for the wrong answer; and iii) The maximum total score was 14 while 0 for the minimum. The scores of pretests and posttests of control and treatment groups were averaged and then compared to determine whether video-based educational intervention significantly improved the levels of knowledge on the rational use of antibiotics or not. All the data were analyzed using the IBM® SPSS® Statistics 25 software.

2.3. Intervention

The intervention model of this study was education using short-duration educational videos uploaded to a social media (TikTok) platform and was implemented in the treatment group for approximately four weeks. Study participants were classified into two groups, namely control and treatment, which each consists of 70 patients. Both groups were asked to complete the pretest using the questionnaire on the patient's knowledge and perception of antibiotic use and microbial resistance.

The treatment group was briefed on how to access and watch educational videos from their smartphone and then asked to watch all videos every day for four weeks. During the treatment period, they regularly received notifications to watch videos for learning the rational use of antibiotics. Meanwhile, the control group did not receive notification support or video but was welcome to independently educate

themselves using conventional media, such as books, pamphlets, posters, as well as other media, except videos. After the treatment period, both groups were asked complete a posttest using the questionnaire. The obtained pretest and posttest scores of both groups were then compared to examine the efficacy of a video-based educational intervention in improving the levels of patient knowledge on the rational use of antibiotics.

2.4. Data analysis

In terms of the hypothesis test, this study employed an inferential statistical analysis, meant to analyze sample data to describe the state of a population. A descriptive analysis test was applied to determine the total scores of the pretest and posttest of both groups. In addition, since the sample data were not normally distributed as shown in Table 1, the Mann-Whitney test was also performed to support the results of the descriptive analysis. To determine whether the sample data were normally distributed, this study utilized a Kolmogorov Smirnov approach, as the number of participants was more than 50.

Table 1. Results of data normality tests using Kolmogorov Smirnov

Group		P-value	Note
Control	Pretest	0.001	Not normally distributed
	Posttest	0.001	Not normally distributed
Intervention	Pretest	0.001	Not normally distributed
	Posttest	0.001	Not normally distributed

2.5. Ethical approval

This study was officially approved by the Research Ethics Committee of the Faculty of Medicine and Health Sciences, Universitas Muhammadiyah Yogyakarta (No.237/EC-KEPK FKIK UMY/VIII/2021). All the respondents provided their consent. They signed the informed consent before their inclusion in this study.

3. RESULTS AND DISCUSSION

It is believed that rational use of antibiotics can reduce the risk of antimicrobial resistance, treatment costs while improving health outcomes; therefore, it is important to provide patient education on this matter. In this case, pharmacists play a key role in providing correct and appropriate drug information to their patients through various educational media, such as books, posters, pamphlets, apps, and videos. Video is a powerful educational tool able to re-show movements or messages using certain effects, therefore strengthening the learning process as well as attracting the patient's attention. In addition, it is also known to have advantages in providing good visualization to facilitate the process of receiving knowledge. Based on these reasons, this study was carried out to determine the efficacy of a video-based educational intervention in improving the levels of patient knowledge on the rational use of antibiotics in the Special Region of Yogyakarta.

3.1. Profiles of study participant

This study involved 140 participants, which was a result of the recruitment process using a quota sampling method. According to Table 2, this study was dominated by the female (57.14%; n=80), aged 18–22 years old (85%; n=119), undergraduates (95%; n=133), and had medium levels of knowledge on the rational use of antibiotics (52.85%; n=74). This finding was similar to previous studies, reporting that most consumers of antibiotics were women for many reasons [15], [16]. One of them, according to the studies, was that women were commonly at higher risk and have a more severe course of illness for infectious diseases than men [17]–[19]. In terms of the levels of education, almost all participants were undergraduates. It was similar to the findings of previous studies, which confirmed that high school graduates and some colleges dominated the antibiotic users [20]. In the aspect of levels of knowledge, it was reported that more than half of the participants were at a medium. Similar findings were also confirmed by previous studies [21], [22]. Table 2 shows the details of the demographic information of the participants involved in this study.

3.2. Homogeneity test

A homogeneity test is applied to determine whether some of the population variances are the same or not. The test was carried out as a prerequisite in the analysis of the independent sample t-test and analysis of variance or ANOVA. The underlying assumption in the ANOVA is that the variances of the population are the same [23]. According to Table 2, the aspect of this study had a significant value of 0.207 for sex, while 0.111 for age, 0.129 for the levels of education, and 0.131 for the levels of knowledge. All the values were

greater than 0.05, which describes that they were homogeneous and there was no significant difference in the participant characteristics of both the control and treatment group.

Table 2. Demographic information of study participants

Demografi	Value (n%) Control (n=70)	Value (n%) Intervention (n=70)	p-value
Sex			
Female	42 (60%)	38 (54.3%)	0.207
Male	28 (40%)	32 (45.7%)	
Age (years old)			
18–22	62 (88.6%)	57 (81.4%)	
23–27	8 (11.4%)	13 (18.6%)	0.111
28–32	0	0	
≥33	0	0	
Levels of education			
Undergraduated	66 (94.28%)	67 (95.71%)	0.129
Graduated	4 (5.72%)	3 (4.29%)	
Levels of knowledge			
Low	4 (5.72%)	14 (20%)	
Medium	40 (57.14%)	34 (48.57%)	0.131
High	26 (37.14%)	22 (31.43%)	

3.3. Validity and reliability test

The validity is the main extent to which a concept, conclusion, or measurement is well-founded and likely corresponds accurately to the real world [24], meanwhile reliability simply means the overall consistency of a measure [25]. A construct validity, which utilized a Pearson's correlation, applied in the previous study by Larasari *et al.* found that all 14 question items of the questionnaire were valid. All the items (n=14) were above the r-table (in this study, it was 0.361). Meanwhile, the result of the reliability test was 0.731 or greater than the value of Cronbach's Alpha (0.691) [13].

3.4. Inferential statistics

The analytical results of the inferential statistics confirmed that the pretest scores, i.e., minimum, maximum, and average, of the control group were 6, 14, and 10.69±1,982, respectively; meanwhile, the posttest scores were 5, 14, and 10.66±2.245. In the intervention group, it was confirmed that the pretest scores were 4, 14, and 9.97±2.383; while the post-test scores were 9, 14, and 12.56±1.223. As seen in Table 3, there was a significant improvement in the mean value of the treatment group by 2.590 with a p-value of 0.001. In contrast with the treatment group, the mean value of the control group dropped by 0.03 with a p-value of 0.315. This finding explains that the improvement in the mean score of the intervention group proves that educational intervention using videos could significantly help to improve the levels of knowledge on the rational use of antibiotics.

The use of video for patient education or health promotion, according to many studies, is more effective than conventional lectures, as the video can increase patient engagement and interest. Since the video-based educational intervention helped improve patient knowledge; therefore, patients can easily understand the information provided by their doctor, pharmacist, nurse, or other health professionals. In short, since regular exposure to information improved the patient awareness as well as behavior, better knowledge will provide a better understanding [26], [27].

Table 3. Inferential statistics of the questionnaire scores of the two groups

Groups		Minimum	Maximum	Mean	Difference (p-value)
Control	Pretest	6	14	10.69±1.982	- 0.03 (0.315)
	Post-test	5	14	10.66±2.245	
Treatment	Pretest	4	14	9.97±2.383	2.590 (0.001)
	Post-test	9	14	12.56±1.223	

3.5. Hypothesis test

An article by Davis and Mukamal in 2006 described that hypothesis testing means the process used to examine the strength of evidence from the sample and to provide a framework for making determinations related to the population, namely it provides an approach for understanding how reliably one can extrapolate

observed findings in a sample under study to the larger population from which the sample was drawn [28]. In this study, as the obtained data were not normally distributed, a Mann-Whitney test was utilized to prove this hypothesis. According to Table 4, the results of the Mann-Whitney test showed the difference in the mean value of post-test scores of the control and treatment group by 1.900 with a p-value of 0.001. It could be concluded that the hypothesis of this study, i.e., the video-based educational intervention significantly helped improve the levels of knowledge on the rational use of antibiotics, could be accepted.

Table 4. The Results of the Mann Whitney test for the questionnaire

Groups		Difference in mean	p-value
Control	Post-test	1.900	0.001
Treatment			

A similar finding was reported by a previous study, which stated that intervention by implementing educational videos would improve short-term patient knowledge to prevent microbial resistance. The aspects of the patient knowledge included the purchase and correct use of antibiotics. The study also gave a note that patient education should be provided continuously as one-time education did not affect the education process [29]. In addition, the results of a systematic review on the video-assisted patient education to modify behavior reported the same finding. This review also suggested that educational videos with a narrative format seem to be a powerful educational tool for patients [30]. Finally, this study suggested that it is better for all healthcare professionals (doctors, pharmacists, and nurses), who provide valid and reliable information, to consider and apply the use of video as a medium for patient education and health promotion on the rational use of drugs, especially antibiotics.

3.6. Limitation of study

This study revealed that an educational intervention using video could significantly help improve the levels of knowledge on the rational use of antibiotics. However, this study should be evaluated in the context of its limitations. First, all study participants were aged between 18–27 years old and owned a smartphone. It means that the results of this study did not represent antibiotic users aged less than 18 or over 28 years old or those who did not own a smartphone. Second, participants of both control and treatment groups live in the same area, so the interaction among participants might occur during the intervention. Unfortunately, it could not be controlled during the study. The last is that the duration of intervention was short (four weeks), meaning that the patient's levels of knowledge on the rational use of antibiotics still tended to be high at the end of the study. Of all study limitations, it was suggested that further study should involve larger sample sizes and a range of age groups and the duration of intervention should be extended for better results.

4. CONCLUSION

This study concluded that a digital intervention using educational videos significantly improved the levels of knowledge on the rational use of antibiotics. It was proven by an increase in the mean value of the treatment group by 2.590 with a p-value of 0.001 and a difference in the mean value of posttest scores of the control and treatment group by 1.900 with a p-value of 0.001. Of the findings of this study, it was suggested that healthcare professionals should consider and apply the use of video as an attractive medium for patient education and health promotion on the rational use of drugs, especially antibiotics.

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