Impact of video-based educational intervention to improve parents' knowledge and awareness towards risk of antibiotic resistance in children: a pre-post interventional design

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Abstract− Due to parental ignorance, carelessness, and inappropriate antibiotic treatment, antibiotic resistance in children is on the rise in Indonesia. This study assesses how animated video education affects parents' understanding and awareness of the hazards of antibiotic resistance in kids. 250 respondents from Karanggedang and Karangcengis Villages participated in the cross-sectional study, which was carried out in May and June 2024. They were chosen using cluster random sampling from 10 Integrated Service Posts. After seeing the instructional video, pre- and post-tests were administered using a validated and dependable questionnaire (Cronbach's alpha >0.6). Significant improvements were shown by respondents, who were mostly low-educated housewives under 30. With a p-value of 0.001 (<0.005), the Wilcoxon test results showed a 23.6% increase in awareness and a 12% increase in knowledge. According to the study's findings, animated video education can effectively raise parental knowledge and comprehension of the hazards associated with antibiotic resistance, highlighting its potential to solve AMR issues.

1 Introduction

The increasing antibiotic resistance has emerged as a significant health concern, potentially enduring humanitarian and economic implications if not proactively addressed. The situation in Southeast Asia was concerning, with a striking 83% of children diagnosed with E. coli infections resistant to first-line antibiotics [1]. Indonesia has a quite high level of AMR as other Southeast Asian countries such as India and Bangladesh [2]. According to data from the Ministry of Health, the level of bacterial resistance in Indonesia continued to increase from 40% in 2013 to 60.4% in 2019 [3]. The 2019 Global Antimicrobial Resistance Surveillance System (GLASS) report revealed alarming news that Indonesia has a significant increase in antimicrobial resistance to E. coli and K. pneumoniae. This includes resistance to important antibiotics such as Carbapenems, Fluoroquinolones, and third-generation Cephalosporins [2]. This alarming trend demands our immediate attention and decisive action. Indonesia established an AMR Control Committee (ARCC) under the Ministry of

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Health's guidance and joined the GLASS in 2019. The Minister of Health Regulation in Indonesia unequivocally outlines the critical and proper use of antibiotics to combat and minimize the occurrence of antibiotic resistance minimize the occurrence of antibiotic resistance [3].

Research conducted in eight provinces across Indonesia on AMR suggests that antimicrobial misuse is widespread, not only in healthcare facilities but also in the community [4]. According to national health data in Indonesia, 10% of people store antibiotics at home and 86.1% obtain antibiotics without a doctor's prescription [4]. In urban areas such as Bekasi, Bandung, Tabalong, and Kalimantan Selatan, it was observed that antibiotics were frequently dispensed without a prescription for pediatric cases of tuberculosis (TB), upper respiratory tract infections (URTI), and diarrhea [4], [5]. In Bekasi, a pharmacist mentioned that parents often come in knowing exactly what they want, such as requesting specific antibiotics and asking for the price [5]. This practice violates government regulations. Significant factors considering AMR are non-compliance to children to consume antibiotics, especially in short-term and long-term antibiotic therapy with chronic conditions like tuberculosis or the children start feeling better, and also the duration of one or more antimicrobials make parents stop giving it [6-10]. Lack of knowledge and awareness in parents about antibiotic use can lead to inappropriate attitudes and habits in giving antibiotics to children, creating favorable conditions for AMR [11-13].

Health education programs targeting parenting communities such as those in several Arab countries, Iran, Hong Kong, Egypt, and Australia can increase awareness of AMR in children and, as a result, reduce inappropriate antibiotic use [8], [14-17], [19-22]. Previous studies on AMR awareness campaigns have also highlighted that explaining the complexity of the social and scientific issues underlying AMR to individuals with limited educational backgrounds is a barrier to successful implementation [23]. Research has shown that using animated videos for health education can increase knowledge and awareness more effectively than traditional lectures and print-based materials. Animated videos increase engagement and interest, and can be distributed quickly and at low cost. Digital communication technologies offer many possibilities for creating engaging and easily accessible materials, which can be shared through social media [22 - 24].

The use of digital communication technology including animation can be used to explain the complex concept of antimicrobial resistance (AMR), but can also be disseminated through social media channels. Animated videos are also more attractive to the current generation who are closer and more fond of the use of advanced technology. Animated videos can make the information provided last longer [8].

Controlling antibiotic use in the community of parents is essential to prevent bacterial resistance. Still, to our knowledge research interventions targeting to improve parents' risk awareness and knowledge of antibiotic resistance in children are minimal through video-based education, especially in Purbalingga, Java Province. We were interested in conducting such research and it is hoped that the current study will be the basis of research to further explore the level of knowledge and awareness of parents towards antibiotic resistance and provide information to be more precise when using antibiotics.

2 Materials and Methode

2.1 Study Design

This study is a cross-sectional study-descriptive design conducted at the Integrated Service Post named "Posyandu" Karangcengis Village and Karanggedang Village Bukateja Sub-district, Purbalingga Regency from May to June 2024. This research has gone through an

ethical review from the Health Research Ethics Committee of Harapan Bangsa University with Number B.LPPM-UHB/185/06/2024. The independent variable of this study is animated video education and the dependent variable of this study is knowledge and awareness.

2.2 Participants and Data Collection

The sample size was calculated using the Slovin formula with a 5% margin of error. The total population of parents in Bukateja District, Purbalingga Regency, Central Java Province is 660 respondents. Therefore, the required sample size for parents who need to fill out the questionnaire is 250 respondents who meet the specified inclusion and exclusion criteria.

The study's questionnaire is divided into two parts, focusing on gauging parental knowledge and awareness of antibiotic resistance in children. The knowledge questionnaire utilized in this research study is based on the scientific article by Pitaloka et al. in 2023 [25], meanwhile, the awareness questionnaire used in this study refers to the scientific article by Kosiyaporn et al. in 2020 [26]. Before collecting research data, the questionnaire underwent validation and reliability testing to ensure its accuracy and consistency (>0.06 *Cronbach's alpha*). The results of the validity test of 14 knowledge question items and 5 awareness question items are declared valid with a value of r count > r table (0.361). A reliability test was conducted, yielding a Cronbach's Alpha value of 0.779, surpassing the minimum alpha > 0.6 requirement, thus indicating a high level of reliability in the measurement results. Measurement of knowledge and awareness of respondents using questionnaires (Pre and Post-test), the answer to the knowledge questionnaire is "Yes" or "No", meanwhile, the answer to the awareness questionnaire is "Agree" or "Disagree".

Data collection was conducted by giving questionnaires on paper sheets to mothers of integrated health posts in Karanggedang Village and Karangcengis Village. The questionnaire was given 2x, namely pretest and posttest. First, a pretest questionnaire was conducted before watching the animated video and then a posttest questionnaire was conducted after watching the animated video.

2.3 Criteria Respondent

2.3.1 Inclusion Criteria

- Parents with children between 0 months and 12 years old who are literate
- Willing to complete a questionnaire

2.3.2 Exclusion Criteria

- Parents with children older than 12 years
- Parents who are illiterate

2.4 Statistical Analysis

The analysis in this study uses software application statistic Statistical Product and Service Solutions (SPSS) 26. Descriptive analysis was performed on sample characteristics and the Wilcoxon test was used to test the relationship between the dependent variable (parents' level of knowledge and awareness of antibiotic resistance in children) and the independent variable (educational video animation). The Wilcoxon test is used to test differences between paired

data, test observations before and after treatment, and determine the effectiveness of a treatment with a significance level of $P < 0.005$.

3 Results And Discussion

3.1 Respondent Characteristics

The characteristics of the respondents are presented in Table 1. Of the 250 respondents, the highest number of respondents aged <30 as many as 170 respondents (68%), and the lowest in respondents aged >30 as many as 80 respondents (32%). Based on Table 1, The largest number of respondents who were not working was 236 (94.4) and the lowest in respondents with working status was 14 respondents (5.6%). Based on education the highest number of respondents with low education (elementary school and junior high school) as many as 179 respondents (71.6%) and the lowest in respondents with higher education (Diploma-Graduate) as many as 4 respondents (1.6%).

Table 1. Respondent Characteristic

Respondent Characteristic		Frequency	Percentage (%)
Age	<30	170	68
	>30	80	32
Jobs	Not Working	236	94.4
	Work	14	5.6
Education	Low	179	71.6
	Medium	67	26.8
	High	4	1.6

Age is one of the factors that influence a person's knowledge. This is in line with other research [27] showed the majority of respondents who attended Posyandu were in the age range of 20-30 years 63.7% (n=58). The activeness of parents who visit the posyandu is housewives because mothers who do not work or housewives only have activities at home [27]. The study [28] identified a contrasting trend: mothers with higher incomes showed lower knowledge compared to those with lower incomes. This difference may stem from the tendency of high-income mothers to immediately consult a doctor when their children fall ill, thus trusting the doctor's prescription without seeking information about antibiotics independently. Another factor could be the professional pressures faced by these mothers, which limit their time to understand the nuances of child health care. Education will affect the learning process, the higher the education the wider and more open a person's level of knowledge [18], [29].

3.2 Parental Knowledge about the Risk of Antibiotic Resistance in Children

As shown in Table 2. The results of the respondents' knowledge questionnaire before education who answered correctly were mostly in numbers 1,8,12 and 14. While the respondents who answered correctly were the least in numbers 2 and 5. Furthermore, the results of respondents' knowledge after education who answered correctly were mostly in numbers 1 and 12, while the respondents who answered correctly were the least in numbers 4 and 5.

Question number 1, namely, antibiotics must be given according to the doctor's recommendation even though the symptoms of the disease begin to improve, all 250

respondents (100%) answered correctly. This is in line with the research [30] that the majority of respondents agreed that people should use antibiotics only when they are prescribed by a doctor or nurse (89.6%). Respondents in South Africa tended to agree that this statement was false (87%), with only 11% choosing the incorrect "true" answer. In comparison, more than one-third of respondents in Nigeria (37%) and Egypt (34%) considered this statement to be "true". This is in line with other study [31] more than 90% of parents thought it was necessary to read the instructions carefully before using antibiotics. According to recent data, 61.4% of parents indicated that they would neither increase nor decrease the dosage of antibiotics themselves.

Question number 2, antibiotics need to be taken when the child is sick regardless of the disease, there are still a few as many 8 (3.2%) respondents who answered correctly. In the management of infection cases, the decision to give antibiotics must fulfill the following principles: the right diagnosis, the right patient, the right type of antibiotic, the right dosage regimen, be aware of side effects and drug interactions [3]. This is in line with the research [32] that about 45% of respondents mistakenly believe that antibiotics can be used for various diseases.

Question number 4, antibiotics are used to treat diseases caused by viral infections, was answered correctly by 40 (16%) respondents. This is in line with research in Boyolali, Central Java by [33] reported that 91% of research respondents answered correctly that antibiotics can kill bacteria. This is in line with the research [30] that fewer respondents incorrectly answered that "antibiotics can kill viruses" (50.7%). The education delivered in this service also emphasizes that antibiotics are only effective for bacterial infections, not for infections by other pathogens such as viruses [34].

Question number 5, coughing requires antibiotics, was answered correctly by only 2 (0.8%) respondents. The majority of respondents still think antibiotics can cure coughs. Question number 8, diarrhea is a disease that requires antibiotics, all 250 (100%) respondents answered correctly. Antibiotic drugs are often used to overcome antimicrobial problems including antibacterial/antibiotic, antifungal, antiviral, and antiprotozoal. Antibiotics are the most widely used drugs in infections caused by bacteria [33]. This is in line with the research [26] that more than 60% of respondents correctly understood that antibiotics are not indicated for treating coughs or headaches.

Question number 14, antibiotic resistance is a phenomenon when antibiotics lose their ability to kill bacteria, all 250 respondents (100%) answered correctly. This is in line with the research [32] that 63.5% of respondents knew that antibiotics were used to treat bacterial infections.

Table 2. Parent Knowledge Questionnaire about the Risk of Antibiotic Resistance in Children

No	Knowledge Questionnaire	Pre-test				Post-test			
		Yes		No		Yes		No	
		n	(%)	n	(%)	n	(%)	n	(%)
1	Antibiotics should be administered according to the doctor's recommendations, even though the symptoms of the disease are starting to improve	250	(100)	0	(0)	244	(97.6)	6	(2.4)
2	Antibiotics need to be taken when a child is sick, regardless of the disease	8	(3.2)	242	(96.8)	59	(23.6)	191	(76.4)
3	Antibiotics are mandatory when treatment with other drugs has no effect	15	(6)	235	(94)	83	(33.2)	167	(66.8)
4	Antibiotics are used to treat diseases caused by viral infections	42	(16.8)	208	(83.2	210	(84)	40	(16)
5	Cough requires antibiotics	248	(99.2)	2	(0.8)	225	(90.0)	25	(10)
6	Fever should be treated using antibiotics	47	(18.8)	203	(81.2)	160	(64.0)	90	(36)
7	Misuse of antibiotics can take a long time to heal	247	(98.8)	3	(1.2)	210	(84.0)	40	(16)
8	Diarrhea is a disease that requires antibiotics	250	(100)	0	(0)	232	(92.8)	18	(7.2)
9	Inappropriate use of antibiotics can cause antibiotic-resistant bacteria	248	(99.2)	2	(0.8)	222	(88.8)	28	(11.2)
10	Inappropriate use of antibiotics can lead to increased medical costs	246	(98.4)	4	(1.6)	170	(68)	80	(32)
11	Antibiotics can kill the "good bacteria" in the body	243	(97.2)	7	(2.8)	176	(70.4)	74	(29.6)
12	Penicillin or Amoxicillin are examples of antibiotics	250	(100)	0	(0)	239	(95.6)	11	(4.4)
13	Paracetamol is an example of an antibiotic	3	(1.2)	247	(98.8)	71	(28.4)	179	(71.6)
14	Antibiotic resistance is a phenomenon when an antibiotic loses its ability to kill bacteria	250	(100)	0	(0)	226	(90.4)	24	(9.6)

3.3 Parental Awareness of the Risk of Antibiotic resistance in Children

In Table 3. Shows that respondents before education who answered correctly were most numerous 4 dan 5. While respondents who answered correctly were the least numerous 1 dan 3. Furthermore, the results of respondents in numbers 1, 2, 4 dan 5, while respondents who answered correctly were least numerous 3.

Questions 1, 2 dan 3 were about the use of antibiotics for flu treatment. The majority of respondents before education thought antibiotics could be used for flu treatment. Then after education, the majority of respondents realized that antibiotic treatment was not used for flu treatment.

There are still many errors in the use of antibiotics related to buying antibiotics without a doctor's prescription, using when a toothache or flu, using without being examined by a doctor, storing and reusing when relapsing, reducing the amount used, not consuming according to the doctor's rules, using experience and to save medical expenses and even using it because it is allowed by officers to buy without a doctor's prescription [35].

The conditions most commonly misidentified as conditions that can be treated with antibiotics are colds and flu. In almost all countries surveyed, the majority of respondents believed that colds and flu can be treated with antibiotics. Participants who recognized antibiotics as medicine, most believed that antibiotics could kill viruses (72,6%) and were effective against colds and flu (73.5%); this belief was significantly greater among individuals in urban areas those aged 18-29 years [16].

This is in line with other research [36] showed that ninety-six percent of respondents agreed with the statement 'I know what antibiotic resistance is', and 80% agreed with the statement, 'I have sufficient knowledge about how to use antibiotics appropriately for my current practice'. This was followed by drug resistance (68%) and antibiotic-resistant bacteria (66%). Those who reported knowing the term antibiotic resistance were asked from which source they heard the term. The source cited by the respondents surveyed was a doctor or nurse (50%), followed by the media (41%), and then a family member or friend (23%) of the flu. Regarding awareness of antibiotic resistance, most participants (83.90%) recognized that bacteria can develop resistance to antibiotics, indicating a good understanding of antibiotic resistance [37].

Table 3. Parental Awareness Questionnaire on the Risk of Antibiotic Resistance in Children

No	Awareness Questionnaire	Pre-test				Post-test			
		Agree		Disagree		Agree		Disagree	
		n	(%)	n	(%)	n	(%)	n	(%)
1	When I have a cold, I should take antibiotics to prevent getting a more serious illness	155	(62.0)	95	(38.0)	41	(16.4)	209	(83.6)
2	When I get a cold, antibiotics help me to get better more quickly	139	(55.6)	111	(44.4)	41	(16.4)	209	(83.6)
3	By the time I am sick enough to talk to or visit a doctor because of a cold, I usually expect a prescription for antibiotics	180	(72.0)	70	(28.0)	47	(18.8)	203	(81.2)
4	Antibiotic resistance is a problem in your country and worldwide	170	(68.0)	80	(32.0)	247	(98.8)	3	(1.2)
5	Antibiotics resistance is an issue that could affect me or my family	169	(67.6)	81	(32.4)	247	(98.8)	3	(1.2)

3.4 Parents' Knowledge Level

To determine the level of knowledge of parents about the risk of antibiotic resistance in children, a questionnaire was used with a total of 14 questions and was carried out by giving *pretest* and *post-test* questions. The level of knowledge of respondents can be said to be good if the percentage is> 80% and the moderate category if the percentage is < 80%. The results of the data obtained from the *pretest* dan *post-test* results conducted on 250 respondents can be seen in Table 4.

Table 4. Results of Data Acquisition Based on Respondents' Knowledge Level

Category	***Pre-Test***		***Post-Test***	
	Frequency (%)	**Percentage (%)**	**Frequency**	**Percentage (%)**
Good	7	(2.8)	37	(14.8)
Medium	243	(97.2)	213	(85.2)

Tabel 5. Wilcoxon Knowledge Test Data

	Knowledge Pretest – Knowledge Postest
Asymp. Sig. (2-tailed)	0,001

Based on Table 4, the *pretest* dan *post-test* results of the knowledge level questionnaire were obtained from 250 respondents. The pretest results explained that respondents had good knowledge about the risk of antibiotic resistance in children, only 2,8% of respondents were in the good category. After educating the respondents using animated video media, the *post-test* results showed that the knowledge level increased to a good category of 14,8%. The results of the study using the Wilcoxon test showed an increase in knowledge of 12% significantly (*p-value* 0.001 <0.005). In line with other research conducted [38] after the intervention, the respondents could answer correctly the questions given by the researcher. After the intervention also resulted in the level of correct answers increasing. In other research [39] showed that the intervention showing animated films had a positive impact on the knowledge gained by participants. The study of providing this educational video was conducted to increase parents' knowledge about the use of antibiotics and the dangers of antibiotics and the dangers of antibiotic resistance [22]. The increased knowledge of respondents is the result of curiosity that occurred after the sensing process. Knowledge in society is influenced by education, information, experience, and interest. This is in line with another research, [22] knowledge can be increased by providing interventions. Research shows that health education regarding the use of assistive devices is more effective than lectures because using animated videos increases people's involvement and interest.

3.5 Parents' Awareness Level

The results of measuring the level of awareness of parents about the risk of antibiotic resistance in children then used a questionnaire with a total of 5 questions and conducted a *pretest* and *post-test*. The results of the data obtained from the *pretest* and *post-test* results conducted on 250 respondents can be seen in Table 5. Based on Table 5, the *pretest* and *post-test* results of the awareness level questionnaire were obtained for 250 respondents. In the pretest section that has not been given education, most respondents are in the good category

14,8%. This means that most parents still have moderate awareness about the risk of antibiotic resistance in children.

Table 6. Results of Data Acquisition Based on the Level of Awareness of Respondents

Category	*Pre-Test*		*Post-Test*	
	Frequency	**Percentage (%)**	**Frequency**	**Percentage (%)**
Good	37	(14.8)	96	(38.4)
Medium	213	(85.2)	154	(61.6)

Tabel 7. Wilcoxon Awareness Test Data

	Awareness Pretest – Awareness Postest
Asymp. Sig. (2-tailed)	0,001

Awareness is an understanding and awareness of certain situations, to improve the performance of a person or group. One of these objectives is to increase public awareness and understanding of AMR through effective communication, education, and training. Thus, to minimize the risk of AMR, it is essential to increase knowledge about antibiotics, appropriate use of antibiotics, and awareness about AMR among the general public [16]. Increased awareness can be caused by good knowledge. Good knowledge provides good understanding, as regular exposure to accurate information can increase awareness and is likely to change behavior. Thus, educational video material can generate many benefits as a tool for community prevention and health promotion programs. The results of the study using the Wilcoxon test showed a significant increase in awareness of 23.6% (p-value 0.001 < 0.005). This study is in line with other research [22] intervention education with video can impact respondents' knowledge about the usage of antibiotics in hospitals in Indonesia.

The study's participant pool encompasses individuals residing in urban and rural areas, spanning a wide range of ages, income levels, and educational backgrounds, thereby enhancing the study's capacity to provide a comprehensive representation of the entire population. Data collection for this research involved the administration of face-to-face questionnaires, which facilitated the validation of response accuracy and served to minimize instances of missing data. However, it is noteworthy that some respondents encountered difficulties in recalling their most recent antibiotic usage, potentially introducing a recall bias.

Furthermore, it is important to note that while certain respondents lacked familiarity with the concept of "antibiotic resistance," they exhibited a greater awareness of antibiotics. This study is subject to certain limitations, particularly in terms of its duration and follow-up. The transient nature of the impact of educational animated videos suggests the necessity for further research to evaluate sustained parental knowledge and awareness AMR in children over an extended period. Measurement of behavioral change. Knowledge and awareness can be measured before and after an intervention, but behavioral change in antibiotic use practices in children is difficult to measure accurately and may require further research or a more in-depth approach.

4 Conclusions

This study highlights the important role of effective educational video interventions to improve parental knowledge and awareness of antibiotic resistance in children. Community-based or multicenter intervention studies are needed to assess the long-term impact of these

educational videos on parental knowledge and awareness of antibiotic resistance among children. Actions that can be taken for patients who are at risk of experiencing antibiotic resistance include stricter or continuous monitoring of antibiotic use to ensure that it is in accordance with the correct rules.

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