Research Paper

Level of Knowledge and Family Behavior in Storing and Disposing of Antibiotics

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ABSTRACT: *The problem of improper storage and disposal of antibiotics can cause damage to the drug and environmental pollution including groundwater. The purpose of this study was to see the level of knowledge and family behavior in storing and disposing of antibiotic drugs in Batang Sangir Village, Kerinci Regency, Jambi Province, Indonesia. This analytical study used a cross-sectional design with a purposive sampling technique. Based on the research that has been done, a total of 705 families who meet the inclusion criteria were obtained. Data collection was done by visiting respondents directly by door to door. This study used a questionnaire instrument that met the validity and reliability test requirements. The results showed that family knowledge of antibiotics was in the good category with a percentage of 78.80%, and family behavior in storing and disposing of antibiotics was in the sufficient and insufficient categories with a percentage of 67.39% and 45% respectively. The level of respondents' knowledge of antibiotic drugs is in the "good" category, behavior in storing antibiotic drugs is in the "sufficient" category, and behavior in disposing of antibiotic drugs is in the "less" category.*
KEYWORDS: *knowledge, family behavior, medicine storage, medicine disposal, antibiotics*

I.   INTRODUCTION

In Indonesia, infectious diseases are a major problem in the health sector. One of the therapies for infectious diseases is by using antibiotics[1]. Antibiotic administration is the main treatment in the management of infectious diseases. However, irrational use of antibiotics can harm patients in terms of less than optimal patient therapy results, unnecessary side effects reactions, and waste of resources, even swelling treatment costs that can burden patients [2]. The use of antibiotics requires appropriate clinical considerations to fulfill rationality to ensure maximum safety, accuracy, and effectiveness. Rational use of antibiotics is defined as giving the right indication, the right patient, the right drug, the right dose, and being aware of the side effects of antibiotics [3]. The use of antibiotics as self-medication is one form of inappropriate or irrational use of antibiotics [4].Antibiotics are drugs used in infections caused by bacteria. Various studies have found that around 40%-62% of antibiotics are used inappropriately for diseases that are do not require antibiotics. Research on the quality of antibiotic use in various parts of the hospital found 30%-80% are not based on indications. The use of antibiotics that are not according to indications will cause antibiotic resistance. Antibiotic resistance is the ability of bacteria to neutralize and weaken the action of antibiotics [5].The results of antibiotic research in pharmacies showed the level of antibiotic use without a prescription amounted to 75.90% of total antibiotic sales [6]. Based on other research conducted on people who have bought antibiotics without a prescription, it is known that the level of knowledge of respondents on antibiotics that fall into the "less" category is 56.44%. There are still many respondents who consider the use of antibiotics can be repeated without a doctor's prescription for the same disease symptoms (89.89%), all antibiotics have the same method and effect (48.09%), antibiotics do not have to be taken until it runs out (47.73%), antibiotics in syrup form for children can still be used after more than 2 weeks (37.63%) and antibiotics can be stored as supplies to be used at any time (53.31%). Behavior related to the symptoms of the disease treated were flu symptoms 26.13%, fever 31.35%,

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and sore throat 12.54%. The most widely used antibiotics were amoxicillin 54.34%, ampicillin 21.64%, and ciprofloxacin 8.36%. Other types that were also quite sought after were tetracycline 4.5% and cefadroxil 4.87% [7].Lack of public knowledge about the correct use of antibiotics and knowledge about antibiotics that are not appropriate are factors that can trigger bacterial resistance to antibiotics [8]. So it is necessary to educate the public regarding DaGuSiBu (Get, Use, Store, and Dispose) of antibiotic drugs to use drugs properly and correctly [9].   Of the four points in drug management, the main problem is often found in the storage and disposal of drugs. People should not carelessly store drugs, especially drugs that must be consumed under the supervision of health workers such as hard drugs and antibiotics [10].The problem of drug storage is not only related to the class of drugs stored but also to the hazards caused by the storage. Length of time and storage temperature can have an impact on drug stability and concentration. The thing to watch out for is that potential changes in drug concentration can result in differences in the estimated impact of drug toxicity. Drug concentrations may increase or decrease depending on the storage conditions [11]. Proper drug storage affects the stability of the drug to be used. The drug should be stored to guard against the effects of air humidity, temperature, and sunlight or sunlight [12].Apart from storage, another drug problem is drug disposal. Problems that can arise due to improper disposal of medicine are drug compounds can contaminate water in the soil, so many drug compounds are present in the water stream with unmeasured levels because no tool can detect the amount of drug contamination in groundwater. Based on research in the community of Pucang Sewu Village, Surabaya, 81 (57.9%) of 140 respondents did not dispose of medicine in the right way. People dispose of medicine directly into the trash without separating the medicine first. This behavior can cause adverse effects on the environment because it can contaminate groundwater, rivers, lakes or even drinking water [10].Batang Sangir Village is one of the villages in Kayu Aro Sub-district, Kerinci Regency, Jambi Province with a total population of 2,392 people, including 1,206 men and 1,186 women, with a total of 786 family heads who were used as respondents in this study [13] According to surveys that have been conducted families in Batang Sangir village did not get education about the storage and disposal of antibiotic drugs when obtaining antibiotic drugs from health facilities.

II.   RESEARCH METHODS

The research was conducted in April-June 2022 in Batang Sangir Village, Kayu Aro District, Kerinci Regency, Jambi Province. The reason for choosing this research location is based on the consideration that the location is quite strategic, easy to reach, and can save time, energy, and research costs.The population in this study were families based on houses or families in Batang Sangir Village, Kerinci Regency. The total population was 786 families or families. Samples taken were families who met the inclusion and exclusion criteria as samples.Inclusion criteria include, Respondents willing to be subjects in the study as evidenced by the respondent's *consent on the informed consent* sheet, willingness to fill out a questionnaire, are currently or have used antibiotic drugs, have sought treatment at a health care facility, are married with a minimum age of 20 years.Exclusion Criteria are Respondents who are not in place at the time of data collection.

2.1. Sampling Technique

The total population sampled in this study was 786 people. Questionnaires were filled in by 705 respondents who met the inclusion criteria of the total population. Questionnaires were distributed *door to door* from each house or family in Batang Sangir Village, Kerinci Regency. For 1 house or 1 family, only 1 person was sampled as a representative, namely the mother or father. If both are willing to be respondents, the researcher will choose the mother as the sample because based on research in Italy, a person's knowledge of drug-related information is that women have more knowledge about drugs than men [14]. The data collection technique in this study uses a questionnaire, which is a data collection technique carried out by giving a set of questions or written statements to respondents to answer [15]. Data collection was randomized in 7 days, namely for 4 days in the morning, afternoon, or evening. In 1 day of distributing questionnaires, data was taken from 12 to 17 respondents. The data collection instrument is a questionnaire modified from the research of Zulkarni R et al [16] with the title "Overview of Family Behavior in Storing and Disposing of Antibiotic Drugs in Pariangan District, Tanah Datar Regency". *Journal of Pharmaceutical and Clinical Science.* Volume 7 No 2 (August 2020) pp.172-179. Before use, researchers conducted a *content validity* test using *Aiken's V* index content validation test and construct validity test. The instruments used were distributed directly from each house or family. The questionnaire used to collect data is a closed questionnaire with a *Guttman* scale, which is a scale used in research to get a firm answer to a problem being asked [15].

2.2. Validity Test

In this study, researchers used *Aiken's V* content validity test. Aiken (1985) formulated Aiken's V formula to calculate the *content validity coefficient* based on the assessment results from the expert panel. This test was conducted using 6 experts (5 pharmaceutical experts and 1 linguist).To test construct validity, expert opinion (*judgment experts*) can be used. Experts are asked for their opinion about the instrument that has been prepared. This validity test included 30 families outside the research population, namely families in Mekar Jaya Village, Kerinci Regency, The reliability test in this study used *Cronbach's Alpha* coefficient to test the reliability of knowledge of antibiotic drugs and behavior in storing and disposing of antibiotic drugs. If the *Cronbach's Alpha* coefficient value> 0.70 then the question is declared reliable or reliable. Conversely, if *Cronbach's Alpha* coefficient <0.70 then the question is declared unreliable [17]. Reliability calculations in this study were carried out using the SPSS 25 program.

2.3 Data Processing

This study uses a closed questionnaire that requires two responses, namely "Yes" and "No" to each questionnaire question. Questionnaire scoring is given with a score of 1 (one) for the correct answer and a score of 0 (zero) for the wrong answer. The formula used to measure the percentage of answers obtained from the questionnaire according to [18], namely:

$$Percentage = \frac{\text{Number of correct scores X 100\%}}{\text{Number of questions}}$$

Arikunto (2010) categorizes a person's knowledge level into three levels based on percentage values, as follows:Good category knowledge level if the score is ≥ 76-100%, he knowledge level of the category is sufficient if the score is ≥ 60-75%, and level of knowledge is categorized as lacking if the score is ≤ 60%

III. RESULTS AND DISCUSSION

In the *content* validity test, researchers involved 6 experts, namely 5 pharmaceutical experts and 1 linguist using *Aiken's V* validity method. At this stage, there are 3 parts of the questionnaire item assessment, namely the content, language, and suitability for research purposes, each of which consists of 3 assessment categories, namely (very relevant, quite relevant, and less relevant) with a V value of 0.83 with a 5% error chance. In the results of content validity testing, there was 1 part of the questionnaire statement about family knowledge of pharmacists that was omitted because it was not by the research title and 1 statement item in the section on family knowledge of antibiotic drugs that was omitted because it was already represented in the section on family behavior in storing antibiotic drugs. The value of *Aiken's V* coefficient ranges from 0-1. Each item in the research instrument was declared valid or relevant with a value of 0.1.≥0,83.The construct validity test was carried out by distributing questionnaires containing 9 statement items for the variable knowledge of antibiotic drugs, 12 question items for the variable behavior in storing antibiotic drugs, and 12 question items for the variable behavior in storing antibiotic drugs.Disposing of antibiotic drugs to 30 respondents outside the study population, namely families in Mekar Jaya Village, Kerinci Regency by distributing questionnaires directly or *door to door*. After obtaining the results of filling out the questionnaire, the data is processed through Excel using the *Pearson Product Moment* correlation technique. The validity test is carried out on each question item with an error rate of 5% if r count> r table then the question item is declared valid or reliable.

Based on the data from the construct validity test results, it can be seen that all items of the variable statement of knowledge of antibiotic drugs and behavior in storing and disposing of antibiotic drugs have a value of r count> r table (0.361) so that all items are declared valid and can be used for research. Based on the data from the reliability test on the knowledge variable of antibiotic drugs, it was found that 9 statement items were declared reliable because they had a *Cronbach's Alpha* value of 0.705. On the variable of behavior in storing antibiotic drugs, it was found that 12 question items were declared reliable because they had a *Cronbach's Alpha* value of 0.835. On the variable of behavior in disposing of antibiotic drugs, it can be seen that 12 question items are declreliable because they have a *Cronbach's Alpha* value of 0.737 so they can be used as a data collection tool in research.

Respondents in this study were families in Batang Sangir Village, Kerinci Regency, namely 705 respondents who had met the requirements according to the inclusion criteria, namely being or having used antibiotic drugs, being married, and being willing to fill out a questionnaire. Respondents who did not meet the

inclusion criteria could not be used as research samples, namely respondents who could not write and read. Most age of the respondents is >40-50 years old which is an adult age of as many as 201 people (29%), >20-30 years as many as 19 people (27%), >30-40 years as many as 149 people (21%), >50-60 years as many as 127 people (18%), >60 years as many as 22 respondents (3%). This is because respondents aged> 60 years have difficulty writing and reading, the older the human age, the more likely it is to experience a decrease in body function, and the least is the age of 20 years as many as 13 respondents (2%) because this is a young age to have a family. This is in line with the research of Sari, *et al.* (2022) which states that 85.75% of the characteristics of respondents are adulthood. Age affects a person's mindset and capacity to capture, the older a person gets, the more developed his mindset and capacity to capture so that more knowledge is obtained.The highest level of education is senior high school / equivalent with 306 people (43%), elementary school as many as 175 people (25%), college as many as 164 people (23%) and the junior high school category being the least, namely 60 people (9%). This is because many families only complete education up to high school. This is in line with the research of Sari, *et al.* (2022) [19] which states that the respondent's education level shows that most of them are in the senior high school / Equivalent category, this level of education will later affect the respondent's knowledge.The most occupational status is in the other category as many as 300 people (43%) where the majority of the population of Batang Sangir Village are farmers, households as many as 187 people (27%), self-employed as many as 134 people (19%), civil servants as many as 53 people (8%) and the least occupational status is private employees as many as 31 people (4%).

3.1 Knowledge and Attitute Evaluation

The knowledge section of the questionnaire included 9 statements in the form of questions in the checklist. The level of knowledge assessed with using 3 categories, namely good if the respondent answers 7-9 statements correctly, sufficient category if the respondent answers 6 statements correctly, and less category if the respondent answers ≤5 statements correctly.The data from the questionnaire on the level of family knowledge of antibiotic drugs are as follows:

Table 1. Distribution of Answers to the Knowledge Section Questionnaire

No.	Statement	Correct	Wrong	Category
		Percentage (%)		
1	Antibiotics are drugs that can kill bacteria	662 (94%)	43 (6%)	Good
2	Antibiotics belong to the class of hard drugs that can only be obtained using a doctor's prescription	508 (72%)	197 (28%)	Simply
3	Antibiotics can used to treat all kinds of diseases	277 (39%)	428 (61%)	Less
4	Antibiotic selection is tailored to the type of disease	643 (91%)	62 (9%)	Good
5	Antibiotics should used until exhausted even if the symptoms of the disease have disappeared	500 (71%)	205 (29%)	Simply
6	Antibiotics may cause allergic reactions	509 (72%)	196 (28%)	Simply
7	Antibiotics used are not as recommended doctors can cause resistance (immunity) to bacteria	617 (88%)	88 (12%)	Good
8	Antibiotic administration for pregnant women and people parents must be very careful	663 (94%)	42 (6%)	Good
9	Residual antibiotics should not be used back when sick	494 (70%)	211 (30%)	Simply

In Table 1, the results obtained in item no. 1 show that 662 people (94%) know that antibiotics are drugs that can kill bacteria. According to Utami, [20] antibiotics or antibiotics are a class of synthetic or natural compounds that are capable of stopping or suppressing biochemical processes against an organism, especially in the process of bacterial infection. In item no 8, which is the most correct answer of the respondents, 663 people (94%) knew that giving antibiotics to pregnant women and the elderly must be very careful. Doctors often

consider giving antibiotics to pregnant women because there are no other treatment options. In addition, the risks resulting from the use of antibiotics in pregnant women provide the risk of the impact of antibiotics on the fetus. The use of antibiotics during pregnancy must follow the instructions and prescriptions of the doctor. Some types of antibiotics that are safe in pregnant women are amoxicillin, ampicillin, penicillin, clindamycin, erythromycin, and nitrofurantoin. In addition to considering the type of antibiotic, antibiotic drugs in pregnant women also consider the dose and period of taking the drug, as well as gestational age. Types of antibiotic drugs that are risky for pregnant women should be avoided, for example, tetracycline-class antibiotic drugs. This type of antibiotic drug is very risky to disrupts the condition of the liver organs of pregnant women and affects the color of teeth in the fetus [21].

3.2. Behavior Section

The questionnaire for the behavioral part of storing antibiotic drugs included 12 questions in the form of a checklist. The level of behavior was assessed using 3 categories: good if the respondent answered 9-12 questions correctly, fair if the respondent answered 8 questions correctly, and poor if the respondent answered ≤7 questions correctly.Questionnaire data on the level of family behavior in storing antibiotic drugs are as follows:

Table 2. Distribution of respondents' answers in the behavior section (Storing Antibiotic Drugs)

No.	Question	Correct	Wrong	Category
		Percentage (%)		
1	Are You aware of that antibiotics should be stored in a good and correct way?	643 (91%)	62 (9%)	Good
2	Do you know how to store? What are the best and correct antibiotic medications?	499 (71%)	206 (29%)	Simply
3	Do you know the purpose of storage What are the best and correct antibiotic medications?	476 (68%)	229 (32%)	Simply
4	Do You know the impact of improper storage of antibiotic drugs?	262 (37%)	443 (63%)	Less
5	Will you store antibiotic drugs that is being used now?	666 (94%)	39 (6%)	Good
6	Will you store antibiotic drugs if left over from previous use?	426 (60%)	279 (40%)	Simply
7	Will you store antibiotic drugs for inventory?	635 (90%)	70 (10%)	Good
8	Will you return the antibiotic medicine when it is not used up to the Public Health Center? Pharmacy, or where you get your medicine antibiotics	23 (3%)	682 (97%)	Less
9	Do you store antibiotic drugs in special container?	430 (61%)	275 (39%)	Simply
10	Do you keep antibiotic drugs away out of reach of children?	660 (94%)	45 (6%)	Good
11	Do you store antibiotic drugs in place that not exposed to direct sunlight?	672 (95%)	33 (5%)	Good
12	Do you keep and separate antibiotic drugs with other types of medicines?	310 (44%)	395 (56%)	Less

In Table 2 item number 5, as many as 666 people (94%) store antibiotic drugs that are being used now. Drug storage in the community, if not followed by proper knowledge, can cause irrational drug use or improper drug storage methods. Improper drug storage can affect the quality of the drugs used [22].In item no. 11 with the most correct answers, 672 people (95%) store antibiotic drugs in a place that is not exposed to direct sunlight. According to The United States Pharmacopeial Convention (2008), [23] drug storage is generally stored in a tightly closed place at room temperature and not exposed to direct sunlight. Some types of drugs such as drugs in tablet and syrup dosage forms should not be stored at *freezer* temperatures or high temperatures. This

is because it can disrupt the stability and effectiveness of the drug preparation.

3.3. Behavior in Discarding Antibiotics

The questionnaire on the behavioral part of disposing of antibiotic drugs included 12 questions in the form of a checklist. The level of behavior was assessed using 3 categories: good if the respondent answered 9-12 questions correctly, fair if the respondent answered 8 questions correctly, and poor if the respondent answered ≤7 questions correctly. Questionnaire data on the level of family behavior in disposing of antibiotic drugs are as follows:

Table 3. Distribution of respondents' answers in the behavior section (Discarding Antibiotic Drugs)

No.	Question	Correct	Wrong	Category
		Percentage (%)		
1	Do you know how to dispose of antibiotic drugs properly?	252 (36%)	453 (64%)	Less
2	Do you know the expiration date on the package of the antibiotic drug?	659 (93%)	46 (7%)	Good
3	Do You know the characteristics of medicine expired antibiotics?	342 (49%)	363 (51%)	Less
4	Do you know what is being done before disposing of antibiotic drugs?	146 (21%)	559 (79%)	Less
5	Will you dispose of antibiotic drugs that have not expired?	167 (24%)	538 (76%)	Less
6	Will you dispose of antibiotic drugs that have expired?	673 (95%)	32 (5%)	Good
7	Would you return the expired antibiotic medicine to the Public Health Center, pharmacy, or where you obtained the antibiotics?	64 (9%)	641 (91%)	Less
8	Will you dispose of antibiotic drugs together with other types of medication?	354 (50%)	351 (50%)	Less
9	You dispose of medicine antibiotics by throwing them directly into the trash?	156 (22%)	549 (78%)	Less
10	Do You dispose of medicine antibiotics and packaging?	58 (8%)	647 (92%)	Less
11	Did you dispose of the antibiotic syrup and the bottle?	663 (94%)	42 (6%)	Good
12	Do you dispose of medicine antibiotics by burning?	273 (39%)	432 (61%)	Less

In Table 3, item no. 10 as many as 647 people (92%) do not know how to dispose of antibiotic drugs along with the packaging. This is in line with the research of Sari, *et al.* [19] that the disposal of damaged drugs cannot go directly to the trash along with the packaging. In item no. 11, 663 people (94%) disposed of antibiotic syrup along with the bottle. The medicine to be disposed of needs to be removed from the packaging. The packaging can be discarded after tearing or cutting. Medicines need to be processed first before disposal and each drug has a different process depending on the dosage form of the drug. For example, ointments cannot be thrown directly into the trash. Ointment or cream formulations need to be cut out of the *tube* first and disposed of separately between the *tube* and the lid. Medicine in the form of syrup should be disposed of into the sewer after diluting the contents of the medicine with water [24].

3.4 Knowledge Category

Based on the results of the study, families in Batang Sangir village had a good level of knowledge of 67%, sufficient 9%, and less than 24%. Scoring for inference is determined by comparing the score achieved with the maximum score:

$$\text{Score} = \frac{\text{Score achieved}}{\text{Maximum score}} \times 100\%$$

$$= \frac{4873}{6345} \times 100\%$$

$$= 78,80\%$$

Based on the results of the above calculations, shows that overall families in Batang Sangir Village are in the "Good" category. This is in line with the research of Zulkarni, *et al.* 16} that this is due to education from pharmacists to patients about how to use antibiotics. Based on the results of the study, shows that families in Batang Sangir village have good behavior as much as 45%, 18% enough, and 37% less. Scoring for inference is determined by comparing the score achieved with the maximum score:

$$\text{Score} = \frac{\text{Score achieved}}{\text{Maximum score}} \times 100\%$$

$$= \frac{5702}{8460} \times 100\%$$

$$= 67,39\%$$

Based on the results of the above calculations, it shows that overall families in Batang Sangir Village have behavior in storing antibiotic drugs in the "Enough" category. The results of this study are in line with the research of Sari, *et al*. [19] which states that the level of knowledge of the Banjarbaru City community in storing drugs at home shows sufficient knowledge of 44.5%. Nevertheless, public knowledge still needs to be improved considering the importance of the correct way of storing drugs at home. This is in line with the research of Zulkarni, *et al.* [16] that the education provided by pharmacists to patients does not focus on antibiotic drug storage, so family behavior in storing antibiotic drugs is categorized as sufficient in terms of knowledge, attitudes, and actions to be taken by respondents in storing antibiotic drugs. Based on the results of the study, shows that families in Batang Sangir village have good behavior as much as 5%, 11% enough, and 84% less. Scoring for inference is determined by comparing the score achieved with the maximum score.Scoring for inference is determined by comparing the score achieved with the maximum score:

$$\text{Score} = \frac{\text{Score achieved}}{\text{Maximum score}} \times 100\%$$

$$= \frac{3807}{8460} \times 100\%$$

$$= 45\%$$

Based on the results of the above calculations, it shows that overall families in Batang Sangir Village have behavior in disposing of antibiotic drugs which are included in the "Less" category. The results of the study are in line with the research of Sari, *et al*. [19] where the majority of respondents have less knowledge related to drug disposal at home. The lack of behavior related to antibiotic drug disposal in Batang Sangir village families needs special attention. Efforts that can be made to improve knowledge of drug disposal at

home include providing education by health workers such as pharmacists, education using leaflets and brochures, conducting *focus group discussions,* and simulating how to dispose of drugs [25]. This is in line with the research of Mahdiyah, *et al.* [26] who said that people need to be given education or behavioral direction about the use of good and correct antibiotic drugs, especially in obtaining, using, and disposing of antibiotic drugs, so that it is expected to reduce cases of antibiotic resistance.

IV.CONCLUSION

The level of respondents' knowledge of antibiotic drugs is in the "good" category, behavior in storing antibiotic drugs is in the "sufficient" category, and behavior in disposing of antibiotic drugs is in the "less" category.

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