Improving the Community's Knowledge, Attitude, and Practice on the Rational Use of Antibiotics is the Role of Primary Health Care

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Abstract. Antibiotic resistance (ABR) is a global health problem. It is found not only in the health sector, but the ABR issue has to be tackled cross-sectors because the root cause of ABR is multi-sectors such as agriculture, livestock, environment sectors, and community. This study aims to assess the community as patients and farmers who use antibiotics with the knowledge, attitude, and practice (KAP) to ABR issue as scientifical information for improving health policy for the related sectors. The study was a cross-sectional survey of farmers and primary health care (PHC) patients in the Makassar sub-district of East Jakarta. Sample locations selected purposively, such as PHC and farms, have to be in the same sub-district, and PHC has a minimum of 100 patients visit per day. The Slovin formula calculated the sample size for patients with a standard error of 5% and a simple random sampling method. Sampling calculated for farmers was total sampling, including farmers' assistants. There were 172 persons for patients and 16 persons for farmer respondents. Researchers asked respondents to fill in a questionnaire about the use of antibiotics properly, the efficacy of antibiotics, the potential harm of antibiotic & their practice of using antibiotics. The study started from August to December 2020. The data were analyzed descriptively. The results showed that the majority of respondents (>60%) were 26 to 45 years old, and most of them had senior high school education (>50%). In general, the KAP of most respondents was not good by means that only <50% of them gave proper answers to questions. Most respondents said antibiotics are most effective for relieving pain and healing influenza (±40%). The most answer to the potential harm of antibiotics is allergies and other adverse effects (30 to 45%). Only ±31% of respondents knew that irrational use of antibiotics leads to their resistance. Based on the study results, the PHC should educate the community that lives in the PHC cover area including farmers, not only its patients. The PHC should also actively involve cross-sectors such as the agriculture and livestock sector, the organization of family and community empowerment and welfare, and other related sectors to educate its community to understand better and be aware of the potential harm of ABR. Without multi-sector collaboration or a One Health approach, ABR control is complicated to do.

Keywords: ABR · AMR · primary health care · multi-sectors · One Health

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1 Introduction

Antibiotics are currently the most commonly prescribed, sold, and used drugs worldwide; however, irrational use of antibiotics occurs in many countries. In Asian countries such as Indonesia, Saudi Arabia, and India, antibiotics can be used with an inappropriate indication of disease, incorrect dose, too long or too short administration time, and can also be accessed without a prescription leading to someone to use antibiotics irrationally or with not sensible [1–3], this also happens in many other countries outside Asia such as Brazil, Poland, Nigeria and many other countries in the world [4, 5]. Therefore, World Health Organization (WHO) states that Antibiotic Resistance (ABR) or Antimicrobial Resistance (AMR) are global public health concerns that threaten human health [6].

The low level of public awareness regarding the irrational use of antibiotics needs to be a concern. Irrational use of antibiotics can cause health problems and become a global threat to health, especially the problem of bacterial resistance to antibiotics. Resistance is the ability of bacteria to neutralize and weaken the action of antibiotics. This situation can lead to antibiotic resistance, which results in ineffective treatment services, increased patient morbidity and mortality, and increased health care costs [6, 7]. The use of antibiotics in the livestock business is also almost unavoidable because livestock is expected to produce optimally to meet the demands of high livestock production. In addition to being used for the prevention or treatment of disease, antibiotics are also used to stimulate livestock growth (growth promoters) which are generally added to feed [8].

Inappropriate use of antibiotics, both in the selection of the type of antibiotic and the dose and duration of use, can cause antibiotic residues in broiler chicken products. If people consume broiler chicken products that contain long-term antibiotic residues, it can cause allergic reactions, tissue damage, GIT (gastrointestinal tract) disorders, carcinogenic, neurological disorders, and antibiotic resistance [9]. Primary health care (PHC) or *puskesmas* is a health service facility that organizes public health and first-level individual health efforts by prioritizing promotive and preventive efforts to achieve the highest public health degree in its working area. Primary health care in health services also provides antibiotic therapy to patients. Data on the rationality of using antibiotics in PHC can be used to improve the health care system, not only curatively but also for education and outreach to the community. So that antibiotic resistance can be minimized to the first level of health services. It is expected to reduce morbidity, mortality, and treatment costs [10, 11].

The aim of the study is that the *puskesmas* can use the information from this research to promote and prevent ABR or AMR. *Puskesmas*, as a health service facility, is an extension of the government to educate the public about the dangers of irrational antibiotic use, which can potentially increase antibiotic resistance.

2 Methods

2.1 Data Collection

We collected data through a survey with a cross-sectional design. The sites were chosen purposively, i.e., the area in Jakarta with livestock farms. Sampling locations were at *puskesmas* and farms. The *puskesmas* selected were *puskesmas* that have a work area

covering the surveyed farms. The selected chicken farms were those that have been running a year plus.

The respondents were recruited from patients attended the chosen *puskesmas* as well as the chicken farmers. The inclusion criteria were: 1. *Puskesmas* patients aged at least 17 years old and personally consented for interviews, 2. Chicken farmers who have been running their business at least a year.

The sample size for *puskesmas* patients was determined by the Slovin formula as follows:

$$n = \frac{N}{1 + N(e^2)}$$

N is the average number of patients per month (Average number of prescriptions per month from January to August 202), which is 300, and e is an error tolerance of 5%; as a result, the number of samples is 172 (rounded). Patients chose selectively. This study is a cross-sectional design. Data collected when the transmission of covid-19 decreased slightly but was still relatively high. Selected respondents are patients at the *puskesmas* who have received medicines and are willing to fill out a questionnaire by signing the informed consent. Before filling out the questionnaire, screening questions ensured that the respondent had used antibiotics before. The situation did not allow the researcher to interview the respondents because of the health protocol. Data collected was carried out for three weeks. The sample of chicken farms is all farms in the Makassar sub-district that met the inclusion criteria, where from each farm there were two farmers were interviewed, i.e., the owner of the farmers and their assistants, by using a structured questionnaire; accordingly, the total number of farmers interviewed was 16 persons. Before the interview, researchers asked all respondents for their consent to be involved as research participants under the provisions contained in the ethical approval from Syarif Hidayatullah State Islamic University (UIN Syarif Hidayatullah) Jakarta, 2020. The questionnaire was simple and easy to understand because the target respondents were assumed to be ordinary people with low to medium social-economic backgrounds. In addition, because the atmosphere of the COVID-19 pandemic is still relatively high, it is endeavored the questionnaire not too long with multiple-choice questions so that respondents can fill in themselves even though at the time of filling, the researcher stands not far from the respondent. The questionnaire had four divisions: 1) the first part was a division to measure about knowledge, 2) the second part was to measure attitude, 3) the third part was aimed to evaluate the practice both for the patients and for the chicken farmers and 4) the fourth was to understand the experiences of using antibiotics. The data collection was performed from August to December 2020.

2.2 Data Analysis

The collected data was edited, cleaned, entered, and then analyzed descriptively using SPSS ver.24.

3 Results

The results of responses toward our first division of questionnaire is listed in Tables 1, 2, 3, and 4.

Table 1 shows that most respondents are in the age range of 26–45 years with an educational background in high school by means they are in productive ages with limited education except 11.7% of patients respondents who have academic/university programs.

The results of filling out the questionnaire related to the community's knowledge of the use of antibiotics can be seen in Table 2.

Table 2 shows that, in general, less than 50% of respondents have correct knowledge about the use and resistance of antibiotics.

Table 3 shows that respondents' attitudes about the use of antibiotics are also not good; they are still willing to use leftover antibiotics, that is 14.5% for *puskesmas* patients and 62.5% for farmers.

Table 4 shows that most of the two groups of respondents got antibiotics from health facilities; however, both did incorrectly by storing and using leftover antibiotics. In terms of checking the expiration date of antibiotics, farmers check it less often (31.3%).

The second division that is designed to know the experiences of using antibiotics is listed in Table 5.

Table 1. Background Characteristic of Respondents

	Puskesmas patients N = 172	Chicken farmers N = 16
Age		
17–25 years old	23.8%	6.3%
26–45 years old	62.2%	68.8%
>45 years old	14.0%	25%
Sex		
Male	30.8%	100%
Female	69.2%	–
Education		
Elementary	–	18.8%
Yunior high school	12.2%	31.2%
Senior high school	76.2%	50%
Academic/University	11.7%	–
Occupation		
Self employee	12.8%	31.2%
Employee	40.7%	68.8%
Housewife	33.7%	–
Student	12.8%	–

Table 2. The knowledge of the respondents about antibiotics

			Knowledge proportion of respondents	
			%age of *puskesmas* patients N = 172	%age of farmers N = 16
1	Efficacy of antibiotics			
	-	For infection disease treatment	42.4	37.5
	-	For flu and cough treatment	23.3	31.3
	-	For pain relieve	23.8	31.3
	-	For allergic	6.4	–
	-	For cold sore treatment	4.1	–
2	The impact of using antibiotics that do not follow administration rules from the doctor			
	-	Can cause allergies or other side effects	45.3	31.3
	-	Potentiate cause antibiotic resistance	31.4	37.5
	-	Can worsen the disease	12.8	18.8
	-	Can cause diarrhea	2.4	–
	-	Can cause nausea	8.1	12.4
3	The impact of using antibiotics without a doctor's prescription			
	-	Potentiate cause antibiotic resistance	34.3	37.5
	-	Can cause allergies	44.8	37.5
	-	Can worsen the disease	19.8	25.0
	-	Can cause diarrhea	1,1	–
4	Sources of information about antibiotic			
	-	Health professionals (doctors, pharmacists, and nurses)	52.9	50
	-	Families/Relatives	36.0	50
	-	Formal education	11.1	–
	-	Media/internet	–	–
5	The meaning of antibiotic resistance			
	-	The body's endurance decreases	36.1	18.8
	-	Antibiotics cannot kill bacteria anymore	30.2	18.8

(*continued*)

Table 2. (*continued*)

			Knowledge proportion of respondents	
			%age of *puskesmas* patients N = 172	%age of farmers N = 16
	-	The body will suffer from allergies	28.5	37.5
	-	The body's endurance increase	–	6.3
	-	The body aches	5.2	18.8

Table 3. The attitudes shown by the respondents in regard with the use of antibiotics

			The attitude proportion of respondents	
			%age of *puskesmas* patients N = 172	%age of farmers N = 16
1	If the respondent is sick, he/she is willing to be treated with antibiotics.			
	-	It depends on the health professionals who treat it.	72.1	50
	-	It depends on the disease.	27.9	37.5
	-	Respondents want to be treated with antibiotics.	–	12.5
2	The respondents have consumed antibiotics several times and feel healthy, but the antibiotics have not run out. Will respondents continue or stop taking antibiotics?			
	-	Keep taking antibiotics until they are finished.	40.1	18.8
	-	Stop taking antibiotics, and the leftover antibiotics are stored.	33.1	6.3
	-	Take antibiotics just when respondents remember.	16.3	18.8
	-	Stop taking antibiotics and give the rest to the family or relatives	7.0	43.8
	-	Stop taking antibiotics, and put the rest into the garbage.	3.5	12.5

(*continued*)

Table 3. (*continued*)

			The attitude proportion of respondents	
			%age of *puskesmas* patients N = 172	%age of farmers N = 16
3	If the respondent is sick, when will the respondent use antibiotics?			
	-	When the respondents received antibiotics prescription from a doctor	64.5	37.5
	-	When the respondents have the flu	28.5	18.8
	-	When the respondents get a headache	4.7	6.2
	-	When respondents have allergies	2.3	31.3
	-	When the body gets aches	–	6.2
4	The willingness of respondents to use leftover antibiotics given by relatives			
	-	Willing	14.5	62.5
	-	Not willing	85.5	37,5

Table 4. The Practice of respondents in the context of practice of using antibiotics

			Practice proportion of respondents	
			%age of *puskesmas* patients N = 172	%age of farmers N = 16
1	A place to buy antibiotics.			
	-	Pharmacy	56.9	68.8
	-	Hospital/PHC	41.9	18.7
	-	Drug stores or food stalls/shops	1.2	12.5
2	Respondent has stored and used leftover antibiotics			
	-	Never, because taking antibiotics until they run out according to the rules of use	36.6	25.0
	-	Ever stored	26.2	25

(*continued*)

Table 4. (*continued*)

			Practice proportion of respondents	
			%age of *puskesmas* patients N = 172	%age of farmers N = 16
	-	Sometimes	21.5	6.3
	-	Never, but immediately thrown away	11.6	18.8
	-	Save leftover antibiotics and give them to relatives in need	4.1	25.0
3	Respondents checking the expiration date of their antibiotics			
	-	Yes, check the expiration date	66.3	31.3
	-	Sometimes	30.8	62.5
	-	Never checked	2.9	6.2

Table 5. The experience of using antibiotics

			Practice proportion of respondents
			% age of farmers N = 16
1	A place to buy antibiotics for livestock		
	-	Poultry shop	75,0
	-	Veterinarian	12.5
	-	Online shop	12.5
2	The purpose of using antibiotics in livestock		
	-	Healing sick farm chickens	68.8
	-	So that the chicken is not skinny	18.7
	-	As a feed additive	12.5
3	Frequency of purchasing antibiotics		
	-	If the chicken is sick	62.5
	-	Do not remember	37.5
4	Knowing the dangers of antibiotics in livestock		
	-	Do not know	93.8
	-	Know	6.2

(*continued*)

Table 5. (*continued*)

			Practice proportion of respondents
			% age of farmers N = 16
5	Knowing the potential for antibiotic residues in chicken meat		
	-	Do not know	100

Table 5 shows that many farmers usually buy antibiotics for their livestock, mainly used to cure sick chickens (68.8%). However, farmers do not know about the dangers of antibiotics and the potential for antibiotic residue in chicken meat.

4 Discussion

The background in this study shows that most respondents from *puskesmas* patients are women, and all farmers are male. In Indonesia, farmers and access to farmers' work are dominated by a male [12]. The age of the majority of respondents ranged from 26 to 45 years for the two groups of respondents. Based on educational background, we can see that *puskesmas* patients have a slightly higher education than farmers; it can be seen that none of the *puskesmas* patients only have elementary education; on the other hand, none of the farmers has attained university education. The Central Bureau of Statistics data shows that most farmers only have a primary school (±75%) [13]. Currently, technology enters almost all aspects of life, including animal husbandry. If the education of farmers is high, awareness of the rational use and resistance of antibiotics will be better, as in the Netherlands [14], as well as more openness to adopting technology in the livestock business to produce fertile and healthy livestock [15].

Based on the results of this study, we can see that only <50% of respondents have correct knowledge about antibiotics, both *puskesmas* patients and chicken farmers. The efficacy of antibiotics is to treat infectious diseases caused by bacteria. Only 42.4% of *puskesmas* patients and 37.5% of farmers answered correctly. In addition, respondents also answered that they use antibiotics to treat colds and coughs (23.3% of patients versus farmers, 31.3%). A study of 420 people in Saudi Arabia (2016) showed that the majority of respondents were willing to use antibiotics to treat diseases caused by viruses such as influenza (67.9%) and sore throat (55.2%) (2). Other studies have shown that a person's education is significantly related to the use of antibiotics for coughs and colds [3]. Farmers in Ethiopia also have a poor understanding of antibiotics, where they thought antibiotics could help treat any disease, regardless of the cause [16].

When the respondents were asked about the consumption of antibiotics that do not follow the rules of use from the doctor and buy their antibiotics without a doctor's prescription, most respondents answered that it could cause antibiotic resistance (44.8% of *puskesmas* patients and 37.5% of farmers). Respondents who understand the meaning of antibiotic resistance, namely bacteria cannot be killed by antibiotics anymore, as many as 30.2% of *puskesmas* patients and 18.8% of farmers. Another study in Yogyakarta-Indonesia states that many people do not understand the meaning of antibiotic resistance.

However, they might perceive the term resistance as "something dangerous," and these findings indicate their awareness of antibiotic use risks [17].

Respondents' sources of information about antibiotics ranged from 50% for *puskesmas* patients and farmers, while those who stated that they came from formal educational institutions were about 11% for *puskesmas* patients. The education level of respondents from *puskesmas* patients reached the academic/university level, which was also 11%. There was a significant association between higher education with good knowledge and appropriate attitude [17]. Factors associated with irrational use of antibiotics were low educational status and younger age [18].

Regarding the attitude of the respondents when asked whether they are willing to be treated with antibiotics if they are sick, in general, the respondents answered that it depends on the health worker who treats and depends on the disease. However, when asked whether they will continue to take antibiotics if they feel better, but there are still antibiotics left from doctors, it turns out that quite a lot of people answered to stop taking antibiotics or continue taking antibiotics only when they remember (49.4% of *puskesmas* patients and 25.1% of farmers). The survey conducted by WHO (2015) in Egypt had similar results 55% of respondents responded that they should stop taking antibiotics when they feel better, rather than taking the entire course [18]. There are also respondents in this study willing to consume leftover antibiotics given by relatives, namely 14.5% of patients and 62.5% of farmers. It is dangerous because they do not know the source of the antibiotic without a doctor's diagnosis or self-medication with antibiotics. A study among the general public of coastal south Karnataka, India, reported that the majority of respondents (67%) show an appropriate attitude towards obtaining antibiotics with a doctor's prescription [3]. However, at the same time, close to 47% of respondents believed leftover antibiotics could be consumed again or given to others. Similar results were found in a Malaysian study where respondents admitted using leftover antibiotics and sharing them with family [19].

The practice of respondents in using antibiotics. Based on the survey results, respondents usually buy antibiotics in health facilities, such as pharmacies, hospitals, or health centers. Although there are still a few respondents (12.5%), farmers buy them at drug stores. Survey results multi-country by WHO reported that there were three quarters (75%) of respondents said that they had taken antibiotics within the past six months; a doctor or nurse prescribed 92% of them these antibiotics, and 97% said that they got them from a pharmacy or medical store; 5% say they bought them from a stall or hawker [18].

What should also be noticed is that there are still quite a lot of respondents who did not check the expiration date of their antibiotics. It is an important issue because, based on research results, it has been proven that expired antibiotics not only cause a decrease in the efficacy of antibiotics but can also lead to increased antibiotic resistance and clinical treatment failure, as well as adverse drug reactions [20].

Most of the farmer respondents in this study had a low level of education, namely elementary school, and most were high school students (50%). The study results showed that almost all respondents did not know the dangers of antibiotics in livestock and the dangers of antibiotic residues in chicken meat. They usually buy antibiotics at the poultry shop (75%) to cure sick chickens. However, some use antibiotics for animal feed so as not

to be thin (30.3%). It can be said that almost all farmers (>90%) do not know the dangers of antibiotics, and even 100% of farmer respondents do not know about the potential residues in chicken meat. This situation also occurs in northwestern China, where misuse of antibiotics in chicken farms is commonly happened [21], in Peru, where antimicrobial growth promoters are still commonly used [22], in Bangladesh, where there were many poultry suppliers use and promote antibiotics [23], and many other countries.

Antibiotics given in small doses to livestock in Indonesia as feed additives to accelerate the growth process have long been reported by Murdiati since 1997 [24]. Inappropriate use of antibiotics in animal husbandry can cause various problems, including resistance. Tetracycline antibiotic residues were reported in chicken meat in Lamongan and Surabaya, East Java [25, 26]. Another study also reports that many farmers give antibiotics to their livestock by themselves because it is easy to get antibiotics, and it seems that no one cares about these practices. In addition, there are a large number of small farms, and this situation makes it difficult to control them [27].

Improper antibiotic use in livestock can potentially develop antibiotic resistance due to stress against these bacteria. Another negative consequence is that there may be antibiotic residues that exceed normal limits. Inappropriate use of antibiotics also causes the accumulation of toxic and harmful residues in livestock meat which can then affect consumers' health and cause allergies. Therefore, the use of antibiotics in livestock is indeed a global issue related to food safety and public health [16].

Primary health care or *puskesmas* is the spearhead of health that deals directly with the community. It is the responsibility of the *puskesmas* to educate the public to live a healthy life. Some principles of *puskesmas* operations in Indonesia include 1. "Health paradigm: *Puskesmas* encourage all stakeholders to participate in efforts to prevent and reduce health risks faced by individuals, families, groups, and communities through the Healthy Living Community Movement.; 2. Regional accountability of *puskesmas*: mobilizing and being responsible for health development in its working area; 3. Community independence: *puskesmas* encourage independent, healthy living for individuals, families, groups, and communities" [10].

In line with this, WHO also stated that the role of primary health care in addressing AMR needs to be better and must be reflected in the national antimicrobial resistance plan. For this reason, it is necessary to revitalize the PHC by strengthening the infection prevention and management system in the community and health facilities. Community empowerment and involvement are crucial to being able to help prevent and manage common diseases without the use of antibiotics. For this reason, it is necessary to have skilled health workers, the availability of first-line drugs and antibiotics, and good and quality diagnostics. In addition, other sectors must also be involved, including the non-government organization (NGO) sector and the private sector. Better community-based monitoring systems are essential for tracking antimicrobial consumption. Multisectoral coordination is crucial because food and agriculture also use antibiotics extensively. Community cooperation through community leaders can voice the interests of the affected communities, such as farmers [11]. This WHO statement is recommended to be implemented in developed countries such as Europe, where it emphasizes the need for international, cross-sectoral collaboration, public education, and health professionals, especially the importance of the One Health approach. Humans, animals, the food

chain, the environment, and the interrelationships between them must be treated as a unit to improve the health of people and animals [28]. Therefore, the One Health approach should be implemented in Indonesia, and *Puskesmas*, as the spearhead of community services with a health promotion function, can be an extension of the government's arm to do this.

5 Conclusion

This study demonstrates that only a small part of the community (<50%) has the proper knowledge, attitudes, and behavior regarding the use and resistance of antibiotics. Therefore, the government needs to pay attention because if people are aware of rational use and resistance, then AMR control will also work well. It is necessary to strengthen of *puskesmas* role in terms of education and counseling to the community, not only counseling to *puskesmas* patients but also to all residents who live in the area that is the working area of the *puskesmas*, including the farmers. Because the function of the *puskesmas* is to help the community achieve the highest level of public health through promotive, preventive, curative, and rehabilitative health efforts. Antimicrobial resistance control should implement a One Health approach. Collaboration with cross-sectors such as the agricultural, livestock, environmental, private, and non-governmental organizations is needed because the *puskesmas* and health sectors cannot work alone.

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