Ministry of Agriculture
Republic of Indonesia

CIVAS
Center for Indonesian Veterinary Analytical Studies

World Organisation
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Founded as OIE

FINAL REPORT

Knowledge, Attitude, and Practice Survey on Antimicrobial Use and Antimicrobial Resistance in Blitar and Malang District

Multi-Partner Trust Fund on Antimicrobial Resistance

Directorate General of Livestock and
Animal Health Services, Ministry of Agriculture
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This final report was prepared by Center for Indonesian Veterinary Analytical Studies (CIVAS) in Bogor, West Java with the support of the Quadripartite Multi-Partner Trust Fund (MPTF) Project team and the Indonesian key stakeholders. This work was funded by the World Organisation for Animal Health (WOAH).

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SUMMARY

Antimicrobial resistance (AMR) has become an emerging health problem globally. WHO has also declared AMR as one of the top 10 global public health threatening human race. Indonesia is one among five countries with the highest projected percentage increase in antimicrobial consumption by 2030. One of the problems in controlling AMR in Indonesia is indiscriminate use of antimicrobials in the human, animal and environmental health sectors. Strategic interventions to increase awareness and understanding of antimicrobial resistance control are carried out through communication, education and training.

In order to control AMR in Indonesia, the Directorate General of Livestock and Animal Health Services, Ministry of Agriculture, in collaboration with the World Organization for Animal Health (WOAH) under the Quadripartite Multi-Partner Trust Fund (MPTF) Project, carries out numerous antimicrobial resistance mitigation activities using the One Health approach. One of its activities is to conduct a KAP survey on the use of antimicrobials and AMR with the aim of measuring the level of knowledge, attitudes and practices (KAP) regarding the use of antimicrobials at the farm level; and identify risks for improving AMU practices at the farm level.

The KAP survey using a cross-sectional study design, was carried out from 13-17 February 2023 on layer chicken farms in Blitar and Malang districts in the province of East Java. Selection of farm locations was based on farms that previously participated in FAO AMR-MPTF survey activities. In two districts, 56 layer farms consisting of 29 farms in Blitar and 27 farms in Malang were subjected to the survey. Data collection was carried out through direct interviews using a questionnaire. The questionnaire consists of 72 questions which are divided into four sections, namely: General information (26 questions), knowledge (17 questions), Attitudes (15 statements), and practice (14 questions).

Data were analyzed descriptively to describe the characteristics of respondents and to asses the KAP on AMU and AMR. Univariate analysis was applied using the chi-square test or fisher's exact test to assess differences in respondent characteristics, livestock, and KAP categories between districts. Correlation test was carried out to determine the relationship between knowledge, attitudes, and practices on the use of antibiotics.

Based on the results of interviews, 87.5% of respondents are farm owners. More than half of the respondents were high school graduates or equivalent (53.6%) with more than 20 years of farming experience (41.1%). Livestock with independent type (94.6%), small business scale (62.5%), and DOC and pullet up until production chicken rearing types (55.4%).

Respondents were able to distinguish drugs that were included in the antibiotic category (87.0%). Antibiotics are still used for prevention (24.1%), antibiotics are obtained from Sapronak (poultry shop) /veterinary drugstores (70.4%). The use of antibiotics in livestock is determined by the owner (81.5%), generally the consideration of using antibiotics is based on information and experience during farming. In addition, considerations in using antibiotics were also determined by veterinarians (46.3%). The purpose of using antibiotics on farms did not have a significant relationship ($p>0.05$) with the level of education, farming experience, type of farm, and business scale.

The knowledge level of the respondents is mostly in the good category (67.9%), moderate (19.6%), and poor (12.5%). The attitude of the respondents was 51.8% moderate, 44.6% good, and only 3.6% poor. Practices carried out in farm regarding the use of antibiotics were 65.3% good, 35.7% moderate, and none of them show poor practice. Based on the correlation test between the values of the level of knowledge, attitudes, and practices, a positively moderate correlation was found, which means that good knowledge about the use of antibiotics and understanding of AMR will have the influence in order to increase positive attitude and to change practice of using antibiotics towards good direction. The level of knowledge and attitude has no significant relationship ($p>0.05$) with the level of knowledge and attitude with the level of education, experience in farming, type of farm, and business scale. However, there is a significant relationship between practice and business scale ($p=0.010$).

The conclusions from the KAP survey are as follows: (1) respondents have good and moderate levels of knowledge, attitudes and practices; (2) there is a correlation between the level of knowledge, attitude, and practice with positive moderate strength; (3) The level of knowledge and attitude is not significantly related to the level of education, experience in farming, type of farm, and business scale. However, practice has a significant relationship with business scale (4) urgency to increase farmer knowledge about the use of antibiotics, and (5) urgency to increase AMR knowledge about how resistant bacteria can develop and spread between animals, humans and the environment.

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1. PREFACE

1.1. Background

Antimicrobial resistance (AMR) has become a global health problem, posing a threat to humans, animals, plants and the environmental health. WHO has declared AMR as one of the 10 global public health threats to human race. The accelerated development of AMR can be caused by the misuse and overuse of antimicrobials (WHO, 2021).

Global consumption of antimicrobials in livestock production is estimated to reach 63,151 (±1,560) tons in 2010 and is projected to increase by 67% to 105,596 (±3,605) tons in 2030. Indonesia is included in the five countries with the highest projected percentage increase in antimicrobial consumption by 2030 (Van Boeckel et al. 2015).

In 2022, the poultry sector in Indonesia has supplied 84% of the demand for protein from animal sources each day with a consumption rate of animal protein originating from poultry as much as 64% (Secretary General of the Ministry of Agriculture, 2022). Domination of the majority of the national poultry market share is controlled by PMA (Foreign Investment) integration companies by 80% and PMDN (Domestic Investment) integration companies by 16%. Only a small amount of the poultry market is being controlled by smallholder farmers, namely partnerships scheme 3% and independent 1% (PPUI, 2015).

The use of antimicrobials in Indonesian poultry to treat infections and prevent disease is concerning because it risks accelerating the rate of antimicrobial resistance. For this reason, intervention measurement from all stkeholders is needed in order to control AMR, including farmers as antimicrobial users.

Provision of veterinary drugs in Indonesia can be carried out by veterinary drug business units that already have permits including: manufacturers, distributors, veterinary pharmacies, depots, pet shops, poultry shops, and veterinary drug stores. Farmers can obtain veterinary drugs through livestock services, veterinarians, and business units providing veterinary drugs. According to Regulation of Minister of Agriculture No. 45 of 2019, it is necessary for farmers to have a prescription to buy antibiotic.

Strategic interventions to increase awareness and understanding of antimicrobial resistance control can be carried out through communication, education, and training. One of the activities that can be carried out is conducting regular knowledge, attitude, and practice (KAP) studies on antimicrobial resistance, infection prevention and control (IPC) and the impact of antimicrobial use and antimicrobial resistance on human health, animals, fish, plants and environment.

Even though there has been some increase in awareness about AMU and AMR in Indonesia through various activities, there are still certain aspects that need attention, namely: (1) the use of antibiotics in poultry farms for disease prevention purposes (*Isriyanthi et al*., 2018) ; (2) infection, prevention and control (IPC) practices that are still lacking in livestock (Coyne *et al*. 2019); (3) limited number of veterinarians working in the government sector who need to provide guidance and supervision to farmers (Siahaan *et al*., 2022); and (4) lack of farmer's knowledge about the use of antimicrobials and antimicrobial resistance (Coyne *et al*. 2019).

In order to carry out antimicrobial resistance control activities using One Health approach, the Directorate General of Livestock and Animal Health Services, Ministry of Agriculture, in collaboration with the World Organization for Animal Health (WOAH) under the Quadripartite AMR Multi-Partner Trust Fund (MPTF) Project, which is a collaboration between the Government of Indonesia and Development Partners (WHO, FAO, WOAH and UNEP).

In the implementation of MPTF AMR project, WOAH has appointed the Center for Indonesian Veterinary Analytical Studies (CIVAS) to measure the understanding layer poultry farmers regarding the AMU and AMR through knowledge, attitudes and practices (KAP) survey.

For additional references, below is a brief description regarding the KAP surveys that have been conducted in human health, animal health, fisheries, and environmental sectors in Indonesia.

1.2. Knowledge, Attitude, and Practice on AMU and AMR in Human Health Sector

Knowledge, Attitudes, and Practices in the Use of Antimicrobials in Society

The 2015 survey of knowledge, attitude, and practice by the Government found that most respondents did not understand the function of antimicrobials, access to antimicrobials, and proper use of antimicrobials. The findings of the study provide information for developing interventions in public health promotion to improve knowledge, attitudes, and practices towards antimicrobials in the general population. In addition, it can assist policy makers in adjusting and designing effective interventions to increase the wise use of antimicrobials in the future (Karuniawati et al., 2021).

Some of the recommendations from the study are (i) auditing antimicrobial prescriptions; (ii) continuing public education programs with the aim of not only increasing knowledge but also improving attitudes and practices in the use of antimicrobials; (iii) targeting health workers (pharmacies, nurses, and midwives) in prohibiting the administration of antimicrobials outside the permitted areas of

authority; (iv) highlighting the role of health professionals (pharmacist, nurse, and midwife) in health education and promotion of appropriate antimicrobial use in society; and (v) control of antimicrobial distribution by implementing strict antimicrobial regulations (Karuniawati et al., 2021).

Limato et al. (2021) has released an analysis of the AMU KAP survey in humans. The systematic review on KAP was done by analyzing 25 reports data on KAP surveys (22 among communities and 3 among healthcare providers). The KAP surveys data were gathered from studies that had been conducted from 2000 – 2021 nationwide and region wide. The place that conducted surveys are pictured in figure 1.

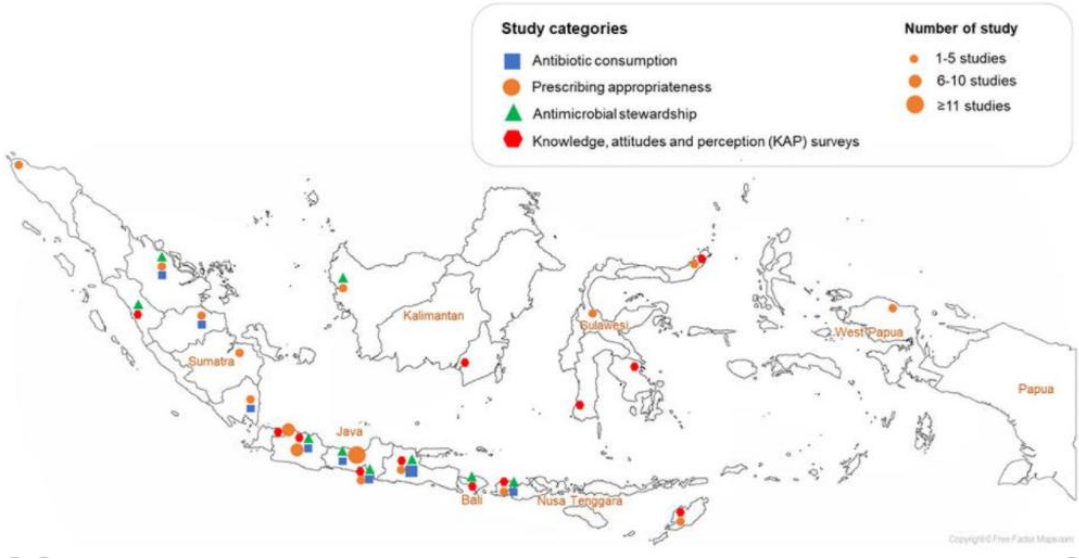

Figure 1. Geographical map of the 100 included reports on antibiotic use in Indonesia 2000-2021. The map includes 2 KAP surveys that were conducted nationwide, and 1 AMS study and 1 KAP survey that were conducted in multiple provinces.

From the surveys, some of the findings can be concluded as follows: Substantial lack of AMR awareness (10 reports) and lack of knowledge about antibiotics (16 reports): 23-26% did not know that antibiotics treated bacterial infections and 58-74% stated that antibiotics can cure viral infections. Antibiotic knowledge was found to be associated with higher education and higher income (2 reports).

As many as 9 reports conclude that antibiotic self-medication without prescription still occurred up to 2020. Based on community respondents, 20%-100% of them had ever done self-medication using antibiotics and 87-100% had ever purchased antibiotics without prescription. Purchasing methods were varies from buying directly at pharmacy (46-90%) at the store 20-44%), or received them from family and friends (9-12%). The main reasons for self-medication included positive previous experience (54-82%), self-

medication being practical (61-83%), easy access from the pharmacy (71%), and doctor visit being expensive (44-72%) or unpractical (56%). The main advisors to self-medicate included health care providers (51-83%), family, relatives or friends (21-45%), internet (71%), or reliance on their own knowledge (71%). Antibiotic adherence levels were not associated with education level or employment status (2 studies).

In one study conducted in Boyolali, stated that men, respondents with low income, those with low-level education, and those living in rural areas are more prone to excessive use of antibiotics without knowing the adverse effects of improper use and how it can contribute to high antibiotics resistance in the future (Karuniawati et al., 2021).

Education about the use of antimicrobials can significantly increase the knowledge of health cadres. Based on the research of Baroroh et al. (2016) in Banyumas district showed that the average knowledge value of cadres increased by 0.97 points after education and the percentage increase in knowledge value was 13.8%. The methods using modules, lectures and discussions. Antimicrobial self-medication by the community is also widely found. Therefore, it is necessary to know what factors influence antimicrobial self-medication by the community for the preparation of appropriate interventions.

The cross-sectional study of Kurniawan et al. (2017) at the Teling Atas Health Center Wanea District, Manado Regency, from interviews with 400 visitors it was found that the majority used antimicrobials within 6 months before the interview (60%), some did self-medication (45.0%) and used antimicrobials without a prescription (32.2%), the majority of self-medication of their own choice (70.6%) and purchased antibiotic in pharmacies (52.2%).

In addition, it is also known that the average value of respondents' knowledge about antimicrobials is in the "medium" category (score 7.14±2.49). Respondents with poorer knowledge had a higher probability of self-medication with antimicrobials, and vice versa (RO=16.86; 95% CI = 4.25–66.83). There is a relationship between self-medication and antimicrobials with age, family income, and the respondent's level of knowledge about antimicrobials. Respondents with a low level of knowledge about antimicrobials have a higher probability of self-medication, so education is needed to the public about antibiotics (Kurniawan et al., 2017).

Knowledge, Attitudes and Practices in the Use of Antimicrobials in Healthcare Providers

The AMR control program in the human sector was initiated with a pilot project in 20 teaching hospitals in the forms of increased understanding of the AMR danger and the implementation of prudent antibiotic use. Irrational use of antimicrobials apparently

also occurs in health care facilities. Several factors that lead to the irrational use of antibiotics are weak implementation and monitoring system of the guidelines and policies related to the antimicrobial use as well as health workers' lack of understanding about the policies. Inappropriate treatment plans and management also appear to be the reason. Another important issue is the incompetence of doctors and or pharmacist (Siahaan et al., 2021).

Antibiotic dispensing without prescription was the most important issue reported among health care providers, with conflicting findings. A survey among 250 community pharmacists in Yogyakarta (Central Java), 68% reported that they would dispense antibiotics without prescription (Asvinigita et al., 2019), whereas a survey among 110 healthcare providers in community health centers in Padang (Sumatera) found that 98.8% did not prescribe antibiotics, despite patient request (Siswati, 2009).

Study of patterns and quality of antibiotics prescribed in Indonesian hospitals (6 hospitals across Jakarta) conducted between March and August 2019 showed that, of 1602 inpatients, 993 (62.0%) received ≥1 antimicrobial. This data is substantially higher than what was being reported in the global point prevalence surveys (PPS) data sets (27%-39%). of 1666 prescriptions, 1273 (76.4%) were antibiotics.

Indications comprised community-acquired infections (42.6%), surgical prophylaxis (22.6%), hospital-acquired infections (18.5%), medical prophylaxis (9.6%), unknown (4.6%) and other (2.1%). The most common reasons for antibiotic prescribing were pneumonia (27.7%), skin and soft tissue infections (8.3%), and gastrointestinal prophylaxis (7.9%). The most prescribed antibiotic classes were third-generation cephalosporins (44.3%), fluoroquinolones (13.5%), carbapenems (7.4%), and penicillins with β-lactamase inhibitors (6.8%). The data indicate a high rate of empirical use of broad-spectrum antibiotics in Indonesian hospitals, coupled with poor documentation and guideline adherence (Limato et al., 2021).

Based on the CIVAS (2017) study conducted from 2013 to 2016 in health care facilities in 3 regencies (Karanganyar, Klaten, and Sukoharjo), it was shown that the knowledge level of respondents on prudent use of antibiotics for humans and antimicrobial resistance is high in doctors and patients visiting healthcare facilities. Hospital doctors have better knowledge compared to Public Health Center doctors. However, some doctors still prescribe antibiotics for non-pneumonia upper respiratory infections and non-specific diarrhea.

To build an integrated surveillance system, WHO conducted a Pilot Tricycle Project in 3 main sectors, humans, animals (food chain) and the environment in all member countries. Indonesia conducted a pilot in October 2018-December 2019 on 100 anal swab samples from pregnant women, 116 patients with bloodstream infections caused by ESBL E. coli, 240 broiler caecum, and 119 environmental samples using standard

methods according to guidelines. The results of the project shown that the ESBL-producing E. coli was found in 40 (40%) of the 100 pregnant women, while the proportion of ESBL-producing E. coli was 116 (57.7%) from 201 patients of the total E. coli-induced bloodstream infections (Puspandari et al., 2021).

1.3. Knowledge, Attitudes, and Practices on AMU and AMR in Animal Health Sector

Knowledge, Attitudes, and Practices of Farmers in the Use of Antimicrobials in Broiler and Layer Farms

Based on the results of a survey conducted by Directorate of Animal Health and FAO on broiler farms in 2017/2018 (877 farmers) and 2020 (542 farmers) in 6 provinces, West Java, Central Java, East Java, West Kalimantan, Lampung, and South Sulawesi, it is known a decrease in the type of independent livestock business and an increase in the type of partnership business. Most of the respondents have high school education. Antimicrobials that are widely used are enrofloxacin and amoxicillin-colistin class. The survey results also found a downward trend in antimicrobial use from 2017/2018 to 2020, including enrofloxacin 41% to 29%, amoxicillin-colistin 40% to 18%, sulfadiazine-trimethoprim from 32% to 9% (DAH, 2020).

From the survey results, it was found a decrease in using antimicrobials for prevention from 81% to 74% and a decrease for treatment from 35% to 26%. The majority of farmers surveyed did not know about the prohibition on the use of colistin (>70%) and there were still found the farmers who kept the remaining colistin (13%) (DAH, 2020).

According to a study done in 2018, in broiler farms in Indonesia, many were still using antimicrobials for prevention and the most commonly used were in the category of critical antimicrobials for human treatment (Isriyanthi et al., 2018). Factors driving the use of antimicrobials in livestock systems are influenced by livestock profitability, disease prevention, and reduced mortality (Coyne et al., 2019).

Based on Purnawarman and Efendi's (2020) study of 74 broiler breeders in Subang District, it is known that most of the breeders have moderate knowledge, attitudes and practices in using antimicrobials. There is a significant relationship between knowledge and attitudes of farmers in the use of antimicrobials in broilers, and there is also a significant relationship between knowledge and practices of farmers in the use of antimicrobials in broilers. Attitude does not show a relationship with the practice of farmers in using antimicrobials in broilers.

Research conducted by Walyani (2019) shows that the level of knowledge of farmers is generally low category, the attitudes are categorized as bad, and affects the amount of antimicrobial use. Factors that influence the level of knowledge of farmers include

formal education and length of raising animals. The higher the level of formal education of the farmers, then the higher the level of knowledge. The farmers who have been raising livestock for a long time, will get a lot of information and experience (Walyani, 2019).

The CIVAS (Center Indonesian Veterinary Analytical Studies) study on 40 layer farms in Central Java in 2014 stated that almost all farms do not have veterinarians (97.5%) or veterinary paramedics (87.5%) so that treatment decisions are determined by the farmers themselves (72.3%). However, the consideration of veterinarians and/or technical services from drug companies is quite influential (68%) of breeders. The level of knowledge of farmers about antimicrobials and antimicrobial resistance is mostly still low (52.5%) (Arief et al., 2016). The level of knowledge of farmers and access to animal health workers are still limited, making the unwise practice of using antimicrobials.

From the results of a Pilot Tricycle Project, in 3 main sectors, humans, animals (food chain) and the environment in Indonesia shown that ESBL-producing E. coli was isolated from 161 (67.1%) out of 240 broilers or 161 (84.3%) out of 191 suspected colonies on MacConkey agar supplemented with 0.4% cefotaxime medium (Puspandari et al., 2021).

Knowledge, Attitudes, and Practices of Farmers in the Use of Antimicrobials in Pig Farms

The CIVAS study on 40 pig farms in Central Java in 2014 stated that 87.5% of farmers determined the use of antimicrobials based on their own experience (87.5%) and input from other farmers (32.5%). The level of knowledge of farmers about antimicrobials and antimicrobial resistance is generally low (72.5%). Overall there are 14 types of antimicrobials used for treatment (100%) and prevention (50%). None of the farmers reported the use of growth-promoting antimicrobials, but direct observation found that some farms used feeds containing growth-promoting antimicrobials, such as Bacitracin (Arief et al., 2016). Inappropriate practices of antimicrobials such as over dosing and the off-label use of human antimicrobial preparations for livestock were observed.

1.4. AMU and AMR in Fisheries Sector

The prevalence of antimicrobial use and the incidence of resistance in the fisheries sector has also become a concern for the Indonesian government. Various efforts have been made to increase awareness and education regarding the use and resistance of antimicrobials. However, there are not many studies that assess the level of knowledge, attitude, and practice towards the use of antimicrobials in this sector.

Diseases due to bacterial infections have been found in aquaculture in Indonesia. Several research results have reported the diversity of diseases caused by bacterial infections in tilapia which are dominated by Aeromonas hydrophila, Pseudomonas sp.

and Streptococcus sp. Various kinds of antimicrobials have been widely used for the treatment and prevention of infectious diseases in cultured fish.

The most common antimicrobial used is tetracycline. This tetracycline was also found in the Study of Pawestri et al. (2019) on 61 tilapia meats in 16 Yogyakarta traditional markets. The results of the study showed that 31% of positive tilapia meat contained tetracycline residues exceeding the maximum residue limit/MRL by High Performance Liquid Chromatography/HPLC (Pawestri et al. 2019).

Research conducted by Yennie et al. (2017) on fresh fishery products obtained from traditional and modern markets in the Special Capital Region of Jakarta and Bogor areas showed the prevalence of Salmonella spp. (32%) on shellfish products (100%), fresh shrimp (30%), fish (30%), and squid (25%). Resistance of Salmonella spp. isolates against a minimum of 1 type of antimicrobial, namely 31% resistant to erythromycin, 11% to amoxicillin clavulanic acid, 4% to tetracycline, and 2% to doxycycline and nalidixic acid. Multi drug resistance (MDR) was also found from the shellfish samples.

Antimicrobial resistance surveillance conducted by the government in 2018 at 10 UPTs in Jambi, Batam, Lampung, Serang, Karawang, Sukabumi, Jepara, Situbondong, Mandiangin, and Karangasem found antimicrobial resistance to oxytetracycline (50%), enrofloxacin (1.3%), and tetracycline (38.7%) in Aeromonas hydrophila isolates. The isolates of Vibrio parahaemolyticus were found to be resistant to oxytetracycline (10%), enrofloxacin (10%), and tetracycline (12.96%). Vibrio alginolyticus bacteria were found to be resistant to oxytetracycline (17.8%), enrofloxacin (10.1%), and tetracycline (20.3%). In the bacteria Salmonella sp. resistance was only found to oxytetracycline (20%) (DGOA, 2019).

Research on knowledge and attitudes towards resistance was conducted in students of the Faculty of Fisheries and Marine Sciences, Bogor Agricultural University (FPIK-IPB) conducted in 2018. The study was designed using a cross-sectional field study method. The sample size of this study was 31.2% of the 850 total population so that 265 samples were obtained. Data obtained through interviews with respondents using a structured questionnaire. The results of the study showed that the level of knowledge of FPIK IPB students towards antimicrobial resistance was generally at a bad level and attitudes at a moderate level. From the results of the study, there was a real relationship between knowledge and attitudes ($p=0.000$, $r=0.524$) (Assidiqi et al., 2018).

1.5. AMR in Environmental Sector

Research on KAP about antimicrobial resistance in the environment sector is still rarely done in Indonesia. However, several facts have been found showing that antimicrobial resistance is very large in the environment.

In the Pilot Tricycle Project in 3 main sectors, humans, animals (food chain) and the environment in Indonesia, the environmental samples were taken in rivers, sewers from upstream to downstream in market areas and residential areas close to slaughterhouses. The results showed that all samples collected from upstream through downstream contained ESBL-producing E. coli with varying concentrations and ratios, log 2.8–7.3 CFU/100 mL and 4.2–30.2% of total E. coli. An average pH under 6.5 was only found in Ciplak (market wastewater), while an average salinity above 2.0 ppm was only found in Cilincing, which is located near the sea. However, in both locations, the E. coli and ESBL-producing E. coli concentrations were not lower than those in other locations according to the same criteria (Puspandari et al., 2021).

The highest concentration of E. coli and ESBL-producing E. coli was found in Ciplak market wastewater (log 8.5 and log 7.3 CFU/100 mL), while the highest ratio of ESBL-producing E. coli to total E. coli was found in Rawa Kepiting slaughterhouse wastewater (30.2%). The lowest ratio of ESBL-producing E. coli was found in Molek surface water (4.2%), although the E. coli and ESBL-producing E. coli concentrations at this site were the highest among the three up/midstream sites. On the other hand, the East Flood Canal (Banjir Kanal Timur/BKT) had lower E. coli and ESBL-producing E. coli concentrations among the three downstream sites (Puspandari et al., 2021).

The CIVAS study in 3 sectors in human, animal (pig farms), and environment around the pig farms during 2014 to 2016 was shown the similar patterns of phenotypic resistances and found the same gene blaTEM and aadA2 in 11 (69.8%) and 3 (18.8%) out of 19 total isolate that tested for genotyping (CIVAS 2017). These results strengthen the hypothesis about the possibility of transmission of resistance genes to the environment, other animals and humans. The impact to human and animal health of resistance can lead to ineffective and more expensive treatment, longer hospitalizations, and increased mortality (WHO, 2020; University of Oxford, 2022).

2. METHODOLOGY

The knowledge, attitudes and practices (KAP) survey of layer farmers regarding the use of antimicrobials (AMU) and antimicrobial resistance (AMR) was carried out using a cross sectional study design. The cross-sectional research design studies the correlation between the independent variables and the dependent variable, with data collection carried out simultaneously at one time (Syapitri, *et al*., 2021).

2.1. Objective

The aim of conducting a KAP survey on the use of antimicrobials (AMU) and antimicrobial resistance (AMR) are:

1. Measuring the level of knowledge, attitude and practice (KAP) regarding the AMU at the poultry farm level; And
2. Identifying risks for improving AMU practices at the farm level.

2.2. Time and Place

The KAP survey was conducted in 13-17 February 2023 on layer farms located in Blitar and Malang districts in the province of East Java.

2.3. Selection of Farms and Target Respondents

The selection of farms for KAP survey was carried out based on the following criteria:

1. The location of the farm is the same with the place where the survey by FAO AMR-MPTF were carried out
2. The survey locations were placed in 2 districts in East Java province, namely Blitar and Malang
3. The type of poultry farm is layer farm
4. Willingness to take part in the KAP survey
5. The farm is still actively operating

Based on these criteria, there were 56 layer farms participating in the KAP survey consisting of 29 farms in Blitar Regency and 27 farms in Malang Regency (Table 1).

Tabe 1. Number of Layer Farms Participated in KAP Survey

No.	District	Total
1	Blitar	29
2	Malang	27
Total		**56**

The target respondents in the layer chicken farms who were interviewed were the farms' owners or managers or workers responsible for farm management and animal health.

2.4. Data Collection

Data collection was carried out through direct interviews using questionnaires to the targeted respondents in each farms. KAP survey interviews were conducted by enumerators who had been trained with the aim of having the same perception and understanding of each question/statement from the questionnaire, the targeted respondents, and the technical implementation of the survey in the field, so that the data collected by each enumerator is appropriate and accurate.

When the data collection activity was started, each of the respondents were provided by information about the execution and objectives of the KAP survey and asked for their consent to be interviewed by signing a consent form.

The KAP survey questionnaire on antibiotic use and antibiotic resistance consists of 72 questions which are divided into four parts, namely:

1. General information
   a. General data of respondents (7 questions)
   b. General farm data (10 questions)
   c. Basic use of antibiotics in farm (5 questions)
   d. Resources for information on antibiotics (4 questions)
2. Knowledges of AMU and AMR (17 questions)
3. Attitudes about AMU and AMR (15 statements)
4. Practices on AMU and AMR (14 questions).

2.5. Data Analysis

Data were analyzed descriptively to describe the characteristics of the respondents, farms, and the level of knowledge, attitudes and practices regarding the AMU and AMR. KAP assessment results are divided into 3 categories, namely: "good" if the score is 75% -100%, "moderate" if the score is 55% -74%, and "poor" if the score is less than 55% (Table 2).

Table 2. KAP Survey Scoring Category

No.	Category	Score
1.	Good	75% - 100%
2.	Moderate	55% - 74%
3.	Poor	< 55%

Univariate analysis was applied using the chi-square test or fisher's exact test (if any number in the table is too small) to assess differences in respondent characteristics, farms, and KAP categories between districts.

Furthermore, the data were analyzed using a correlation test to determine the relationship between knowledge, attitudes, and practices towards the use of antibiotics. The strength of the correlation is interpreted as weak if the coefficient is ≤0.3, medium/moderate if the coefficient is from >0.3 to ≤0.6, and strong if the coefficient is >0.6 (Akoglu, 2018).

3. RESULT OF KAP SURVEY

3.1. General Information

3.1.1. Respondent's Characteristics

In general, the characteristics of the respondents on layer farms in Blitar and Malang district were almost the same, except for the position of the respondents being interviewed. Complete characteristics of respondents in layer farms in each district can be seen in Table 3.

Table 3. Characteristics of Respondents in Layer Farms Participated in KAP Survey

Respondent's Characteristics	Blitar District		Malang District		Chi-Square Test (P Value)	Total	
	Total	Percentages	Total	Percentages		Total	Percentages
Gender							
Male	23	79.3	25	92.6	p = 0.156	48	85.7
Female	6	20.7	2	7.4		8	14.3
Age Category							
Adult (26-45 years old)	10	34.5	10	37.0	p = 0.919 (Adult and Elderly)	20	35.7
Pre-Elderly (45-59 years old)	18	62.1	17	63.0		35	62.5
Elderly (>60 years old)	1	3.4	0	0.0		1	1.8
Educational Level (Latest)							
Elementary School	2	6.9	4	14.8	p = 0.850	6	10.7
Junior High School	4	13.8	3	11.1		7	12.5
Senior High School/ equivalent)	17	58.6	13	48.1		30	53.6
Diploma	1	3.4	1	3.7		2	3.6
Undergraduate/ Veterinarian/ Master	5	17.2	6	22.2		11	19.6
Farming Experience							
< 11 years	8	27.6	8	29.6	p = 0.142	16	28.6
11-20 years	12	41.4	5	18.5		17	30.4
> 20 years	9	31.0	14	51.9		23	41.1
Position in Farm							
Owner	28	96.6	21	77.8	**p = 0.034***	49	87.5
Manager	1	3.4	6	22.2		7	12.5

Information: sign* shows a significant difference (P Value < 0.05)

Based on the interview results obtained from 56 respondents, the majority respondents were male (85.7%) and there was no significant difference (p=0.156) between Blitar and Malang districts.

Based on Regulation of Ministry of Health No. 25 of 2016, age can be grouped into categories of adults (19-44 years), pre-elderly (45-59 years), and elderly (over 60 years). Most of the respondents' ages were in the pre-elderly category (58.9%) and there was no significant difference (p=0.919) between districts.

More than half of the respondents had the last level of education at SMA (senior high school) or equivalent (53.6%), with no significant differences (p=0.850) between districts. Experience chicken farming was generally more than 20 years (41.1%), not showing a significant difference (p=0.142) between districts.

87.5% of interviewed respondents were the owners of the surveyed farms. Based on the chi-square test, the respondent's position on the farm showed a significant difference between Blitar and Malang districts with p=0.034 (p<0.05). In Blitar Regency, 96.6% respondents were the owner of the farm and 3.4% were manager or person in charge. Meanwhile, in Malang Regency, 77.8% respondents were the owner of the farm 22.2% were managers or persons in charge.

3.1.2. Farm's Characteristics

The chicken farming business system in Indonesia is divided into two systems, namely the partnership and independent business systems. The independent business system requires all the needs for farming activities are borne by the farmer himself. The partnership business system shows cooperation between two parties, which are the company and the farmer. In a partnership system, generally the company will provide day old chicken, feed, vaccines, medicines, to the marketing process. On the other hand, farmers will provide houses, equipment, and labor to raise chickens in accordance with the Standard Operating Procedures (SOP) set by the company.

Based on Minister of Agriculture Regulation No. 14 of 2020, layer farm's business scale is divided into 4 categories, namely micro (≤ 1,000), small (1,001 - 11,500), medium (11,501 - 230,000) and large (> 230,000). In this survey, the business scale is grouped based on the housing capacity. Based on the survey's result, in terms of business scale, most of the farms participating in the survey were categorized as small (62.5%) and medium (37.5%) scale and none were in the micro and large-scale categories. At the time of the survey, in some farms, population of chickens was below the housing capacity. In this survey, the highest number of chicken population raised by the farmers was <5,000 chickens (44.6%). DOC and pullet to production types of rearing had the highest percentage (55.4%) compared to DOC to production type of rearing (30.4%) and pullet to production type of rearing (14.3%).

Farm characteristics in Blitar and Malang districts did not show significant differences in terms of business scale (p=0.300), chicken population (p=0.060), and type of chicken rearing (p=0.535). The characteristics of the farms participating in the KAP survey can be seen in Table 4.

Table 4. Layer Farm's Characteristics on KAP Survey

Farm's Characteristics	Blitar district		Malang district		Chi-Square Test (P value)	Total	
	Total	Percentage	Total	Percentage		Total	Percentage
Farm Type							
Independent	29	100	24	88,9	P=0,106 (*Fisher Exact*)	53	94,6
Partnership	0	0,0	3	11,1		3	5,4
Business Scale							
Small	20	69.0	15	55.6	p = 0.300	35	62.5
Moderate	9	31.0	12	44.4		21	37.5
Chicken poulations (head)							
< 5.000	12	41.4	13	48.1		25	44.6
5.000-10.000	12	41.4	4	14.8	p = 0.060	16	28.6
> 10.000	5	17.2	10	37.0		15	26.8
Rearing Type							
DOC - production	10	34.5	7	25.9	p = 0.535	17	30.4
Pullet - production	5	17.2	3	11.1		8	14.3
DOC and Pullet - production	14	48.3	17	63.0		31	55.4

3.1.3. Basic Use of Antibiotics in Farm

Layer farms still use drugs (96.4%) consisting of vitamins, minerals and antibiotics. However, 3.6% of farms were found not using drugs, instead using herbal poducts.

In farm using drugs, respondents can understand or differentiate drugs that categorized as antibiotics (87.0%). Antibiotics was mostly used for treatment (75.9%), although the antibiotics used for prevention still could be found (24.1%).

Most of the antibiotics used in farm came from poultry shop/animal drug store which reached 70.4%. 46.3 % of antibiotics obtained from drug companies and only 13.0% obtained from veterinarians. In determining the use or selection of antibiotics on farms, most were determined by the owner of the farm (81.5%), with the consideration for the use of antibiotics was based on farming experience and information obtained during farming. In addition, considerations in using antibiotics were also determined by veterinarians (46.3%) and a small part were based on animal health officer's consideration (5.6%), other farmers (5.6%), farm operators (3.7%).

In Blitar and Malang districts, the use of antibiotics in farm did not show any significant differences (all p values > 0.05). The complete basis for using antibiotics can be seen in Table 5.

Table 5. Antibiotic Use in Layer Farms

Antibiotic Use	Blitar district		Malang district		Chi-Square Test (P value)	Total	
	Total	Percentage	Total	Percentage		Total	Percentage
Veterinary drug use							
Use	28	96.6	26	96.3	p = 0.959	54	96.4
Not use	1	3.4	1	3.7		2	3.6
Understanding of veterinary drugs included as antibiotics							
Understood	26	92.9	21	80.8	p = 0.186	47	87.0
Do not understand	2	7.1	5	19.2		7	13.0
Purpose of Antibiotic Use							
Prevention	5	17.9	8	30.8	p = 0.267	13	24.1
Treatment	23	82.1	18	69.2		41	75.9
Antibiotic Growth Promoter (AGP)	0	0.0	0	0.0		0	0.0
Source of Antibiotics							
Veterinarian	2	7.1	5	19.2	p = 0.330	7	13.0
Animal health workers	0	0.0	0	0.0		0	0.0
Drug Company	12	42.9	13	50.0		25	46.3
Poultry Shop/ animal drug stores	22	78.6	16	61.5		38	70.4
Other farmers	0	0.0	0	0.0		0	0.0
Decision Makers in Antibiotic Use							
Veterinarian	12	42.9	13	50.0	p = 0.677	25	46.3
Animal health workers	1	3.6	2	7.7		3	5.6
Owner	26	92.9	18	69.2		44	81.5
Farm Operator	0	0.0	2	7.7		2	3.7
Other Farmers	2	7.1	1	3.8		3	5.6

3.1.4. Source of Information on Antibiotics

Knowledge about antibiotics and their use is very important for the farm with a percentage of 96.4%, but 3.6% said it was not important. Respondents who stated that it was not important because there were already officers responsible for treatment from drug companies or their business partner. The importance of knowledge about antibiotics and their use in Blitar and Malang districts did not show a significant difference (p=0.156).

66.1% farmers obtained information or explanations about antibiotics and their use within the last 1 year with a frequency of 1-3 times, while 32% farmers never received information within that period. The frequency of respondents who received information about antibiotics and their use showed a significant difference between Blitar and Malang districts with p=0.003 (p<0.05). In Blitar district, 82% respondents had received 1-3 times of informations and only 4% had never received any. In contrast to Malang district, 48.1% of respondents had received informations for 1-3 times and while 51.9% of respondents had neverreceived any informations.

Source of information for most respondents were drug companies (78.6%), followed by the animal husbandry service (60.7%), training or seminars (57.1%), other farmers (55.4%), conventional socialization media such as poster, brochure, leaflet, etc (33.9%), internet (32.1%), and social media such as facebook/instagram (19.6%). Even though there were many sources of information available, almost half of the total respondents (50%) stated that they still did not have sufficient sources of information about antibiotics and their use.

In Blitar and Malang districts, there was no significant difference in terms of sources of information about antibiotics (p=0.800) and sources of information they already had (p=0.061). Complete information sources about antibiotics in layer chicken farms in Blitar and Malang districts can be seen in Table 6.

Table 6. Sources of Information about Antibiotic in Layer Farm

Information Regarding Antibiotic	Blitar district		Malang district		Chi-Square Test (P value)	Total	
	Total	Percentage	Total	Percentage		Total	Percentage
Knowledge regarding antibiotic is very important							
Important	29	100	25	92.6	0.228 (*Fisher Exact*)	54	96.4
Not important	0	0	2	7.4		2	3.6
Explanation about antibiotic							
> 3 times	1	3.4	0	0.0		1	1.8
1-3 time(s)	24	82.8	13	48.1	**p = 0.003***	37	66.1
Never	4	13.8	14	51.9		18	32.1
Source of Information on Antibiotics							
Livestock Services	21	72.4	13	48.1	p = 0.800	34	60.7
Drug Company	24	82.8	20	74.1		44	78.6
Other farmers	18	62.1	13	48.1		31	55.4
Training/seminars/other activities	21	72.4	11	40.7		32	57.1
Socialization media (posters. brochures. leaflets. etc.)	9	31.0	10	37.0		19	33.9
Internet	9	31.0	9	33.3		18	32.1

Information Regarding Antibiotic	Blitar district		Malang district		Chi-Square Test (P value)	Total	
	Total	Percentage	Total	Percentage		Total	Percentage
Social media (Facebook/ Instagram. dll)	5	17.2	6	22.2		11	19.6
Other sources	0	0.0	4	14.8		4	7.1
Having Sufficient Sources of Information about Antibiotics							
Have sufficient sources of information	18	62.1	10	37.0	p = 0.061	28	50.0
Not having enough sources of information	11	37.9	17	63.0		28	50.0

Information: sign* shows a significant difference (p value <0.05)

3.1.5. The Relationship Between the purpose of Antibiotic Use and the Characteristics of Respondents and Farms

To see whether there is a relationship between the purpose of using antibiotics on farms and the characteristics of respondents and farms, especially in the education level, farming experience, type of farm, and business scale categories, a chi-square test was performed.

In the analysis of the relationship between the purpose of using antibiotics use on farms and respondents' characteristics, the data analyzed were taken from 54 respondents without comparing between districts. The remaining 2 respondents were not included since they did not use antibiotics.

In this analysis, the education level is grouped into 3 categories based on Law No. 20 of 2003 as follows: (1) Basic education is the level of education which consists of elementary school and junior high school; (2) Secondary education, is the continuation of basic education which includes general high school or Vocational High School; (3) Higher education is the level of education after secondary education.

Based on the test results, no significant relationship was found between the purpose of using antibiotics on farms and the level of education (p=0.355), farming experience (p=0.053), type of farm (p=0.570), and business scale (p=0.180). Especially for the type of farm, the results obtained may be affected by the small number of partnership type farms participating in the survey (3 farms). The complete results are shown in Table 7.

Table 7. Relationship Between the Purpose of Antibiotic Use and the Characteristic of Respondents and Farms

Category	Preventive		Treatment/Medicative		Chi Square Test (P Value)
	Total	Percentage	Total	Percentage	
Last Education					
Basic Education	3	23,1%	10	24,4%	p =0,355
Secondary Education	5	38,5%	23	56,1%	
Higher Education	5	38,5%	8	19,5%	
Farming Experience					
< 11 years	7	53,8%	8	19,5%	p =0,053
11-20 years	3	23,1%	14	34,1%	
> 20 years	3	23,1%	19	46,3%	
Farm Type					
Independent	13	100%	38	92,7%	p = 0.570 (*Fisher Exact*)
Partnership	0	0	3	7,3	
Business Scale					
Small scale	10	76,9%	23	56,1%	p =0,180
Medium scale	3	23,1%	18	43,9%	

3.2. Knowledge, Attitude, and Practice regarding Antimicrobial Use and Antimicrobial Resistance

Based on the results of the assessment, it shows that the average percentage value for knowledge, attitude, and practice are 74.8%, 73.5%, and 79.4% respectively. The distribution of the assessment results can be seen in Figure 1.

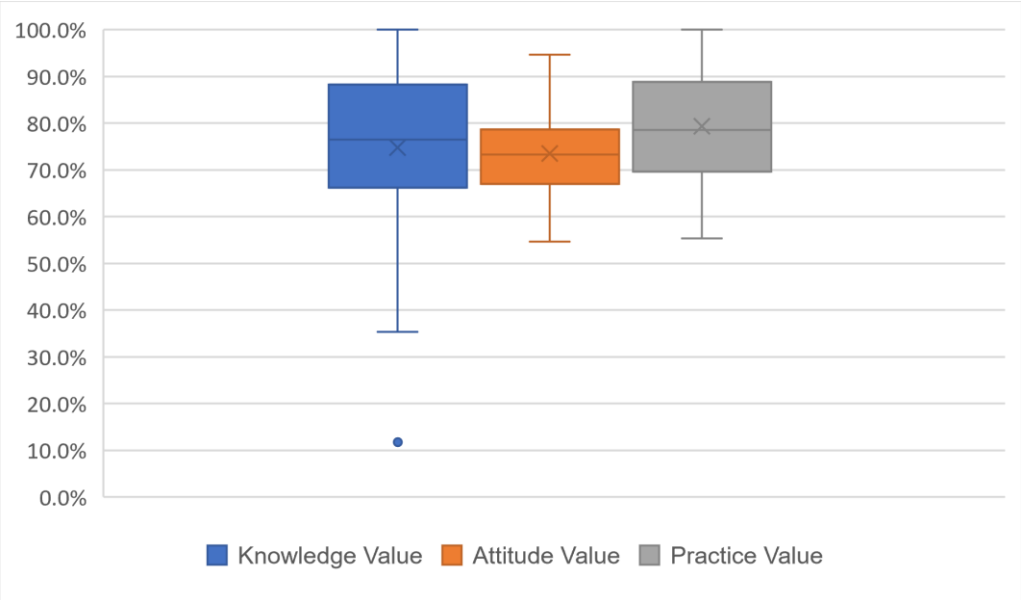

Figure 1. Distribution Values of Knowledge, Attitude, and Practice Level

3.2.1. Knowledge

The survey results showed that most farmers had a good level of knowledge about AMU and AMR with 67.9% categorized as good, 19.6% categorized as moderate, and 12.5% categorized as poor. There was no significant difference (p=0.875) in the level of knowledge between Blitar and Malang districts (Table 8).

Table 8. Assesment of Respondents' Knowledge

Knowledge Level	Blitar district		Malang district		Chi-Square Test (P value)	Total	
	Total	Percentage	Total	Percentage		Total	Percentage
Good	**20**	**69.0**	**18**	**66.7**	p = 0.875	**38**	**67.9**
Moderate	6	20.7	5	18.5		11	19.6
Poor	3	10.3	4	14.8		7	12.5

Total number of questions related to knowledge on AMU and AMR is 17. To assess the respondents' answers to the questions of knowledge, it was found that 8 questions had a rate of more than 30.0% with incorrect answers (Figure 2). Among them, there were 4 questions related to the use of antibiotics (AMU) that were still answered incorrectly by the respondents, namely: antibiotics can be used only after a clinical examination by a veterinarian (42.9%), antibiotics can only be purchased/obtained using a doctor's prescription (42.9%), antibiotics should not be used for prevention disease (32.1%), and antibiotics should not be used to treat diseases caused by viruses (30.4%).

Meanwhile, the 4 questions about AMR that were answered incorrectly by the respondents, namely: resistant bacteria can be transferred/moved to animals or humans, through animals infected with resistant microorganisms (37.5%), through contaminated animal products (41.1%), and through the environment (35.5%), as well as the use of inappropriate combination antibiotics can affect the occurrence of AMR (30.4%).

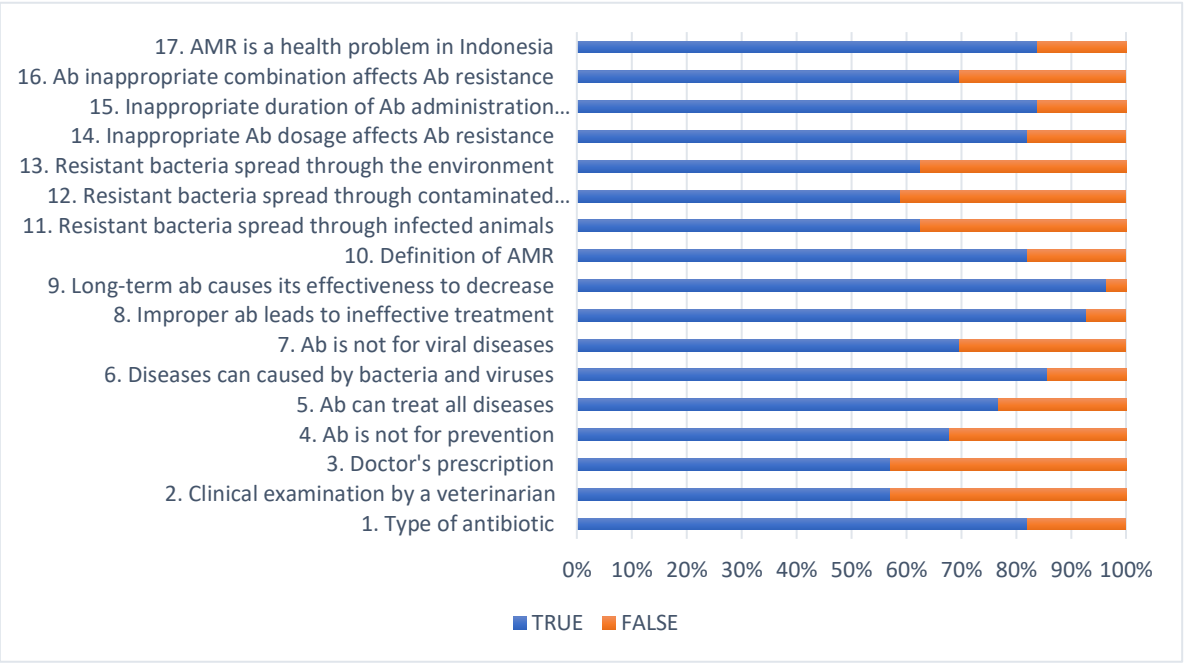

Figure 2. Respondents' Answer to Knowledge Question

3.2.2. Attitude

Respondents' attitudes towards the use of antibiotics were mostly included in the moderate category at 51.8%, 44.6% in the good category and only 3.6% were poor. The attitude of respondents between districts did not show a significant difference (p=0.998). Attitude assessment can be seen in Table 9.

Table 9. Assessment on Respondents' Attitude

Attitude	Blitar district		Malang district		Chi-Square Test (P value)	Total	
	Total	Percentage	Total	Percentage		Total	Percentage
Good	13	44.8	12	44.4	p = 0.998	25	44.6
Moderate	**15**	**51.7**	**14**	**51.9**		**29**	**51.8**
Poor	1	3.4	1	3.7		2	3.6

Based on the respondents' answer to the attitude statement given, the respondents' attitude was categorized into:

1. Positive Attitude:
    a. Respond to positive statements by agreeing and strongly agreeing
    b. Respond to negative statements by disagreeing and strongly disagreeing
2. Neutral Attitude: Responding doubtfully
3. Negative Attitude:

a. Respond to positive statements by disagreeing and strongly disagreeing
b. Respond to negative statements by strongly agreeing and agreeing

Total number of questions related to attitude on AMU and AMR is 15 (Figure 3). When examining respondents' answers regarding attitude statements, it was found that there are 3 statements with a negative attitude category rate of more than 30.0%. Among them, there are 2 statements about AMR that were answered negatively by the respondents which are Infected animals carrying resistant bacteria can transmit their resistance to farmers and their families (48.2%) and Resistant bacteria can contaminate chicken products, affecting human health (37.5%). Additionally, there was 1 statement regarding antibiotic use, namely using the remaining unused antibiotics on farms will save costs (30,4%).

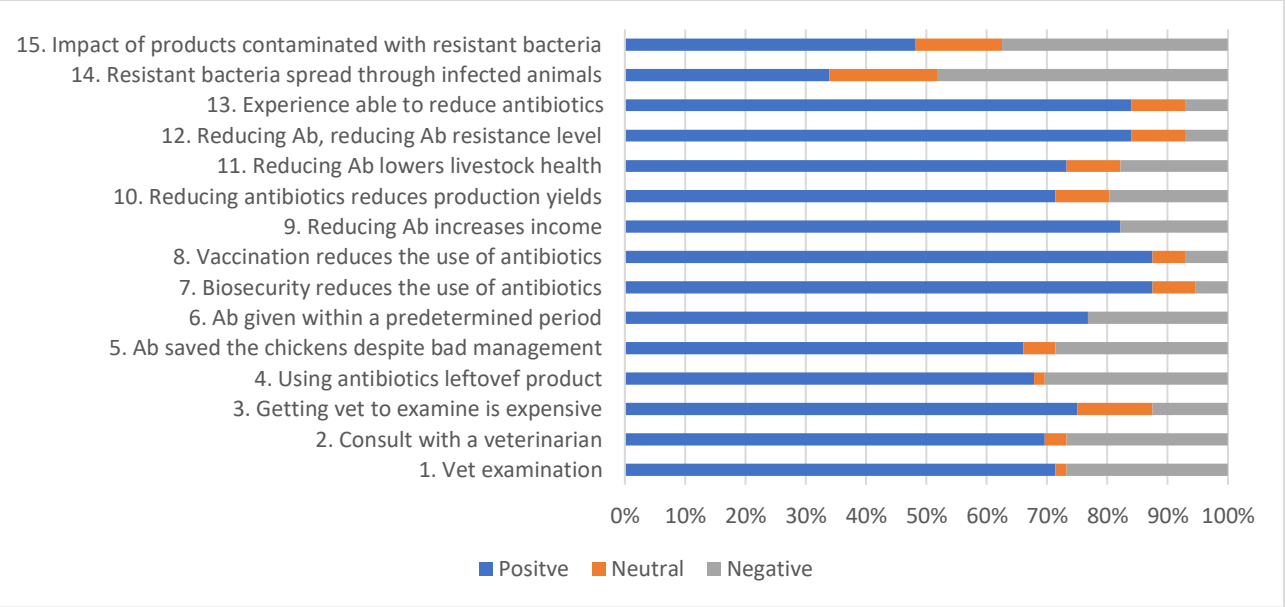

Figure 3. Respondents' Answer to Attitude Question

3.2.3. Practice

Practices carried out in farm regarding the use of antibiotics were included in the good (65.3%), moderate (35.7%) categories, and none had poor practice. The AMU between districts did not show a significant difference (p=0.449). Practice assessment can be seen in Table 10.

Table 10. Assessment on Respondents' Practice

Practice	Blitar district		Malang district		Chi-Square Test (P value)	Total	
	Total	Percentage	Total	Percentage		Total	Percentage
Good	20	69.0	16	59.3	p = 0.449	36	64.3
Moderate	9	31.0	11	40.7		20	35.7
Poor	0	0.0	0	0.0		56	0.0

Based on the respondents' answers to the practice questions given, the respondents' practices were categorized into:

1. Right Practice:
   a. Answer positive questions with answers Always and often
   b. Answer negative questions with answers sometimes and never
2. False Practice:
   a. Respond to positive statements with answers sometimes and never
   b. Answer negative questions with answers always and often

Total number of questions related to practice on AMU and AMR is 14 (Figure 4). When examining respondents' answers regarding practice questions, it was found that there are 4 questions with a rate of more than 30.0% where farmers engage in incorrect practices. Among them, the following practices related to antibiotic use were answered incorrectly namely buying antibiotics with a prescription from a veterinarian (55.4%), using antibiotics based on examination results from a veterinarian (55.4%), using antibiotics for the specified duration according to the prescription/label, even if the chickens appear to have recovered (32.1%), and consulting the same veterinarian if the chickens do not recover after the prescribed treatment period (53.6%).

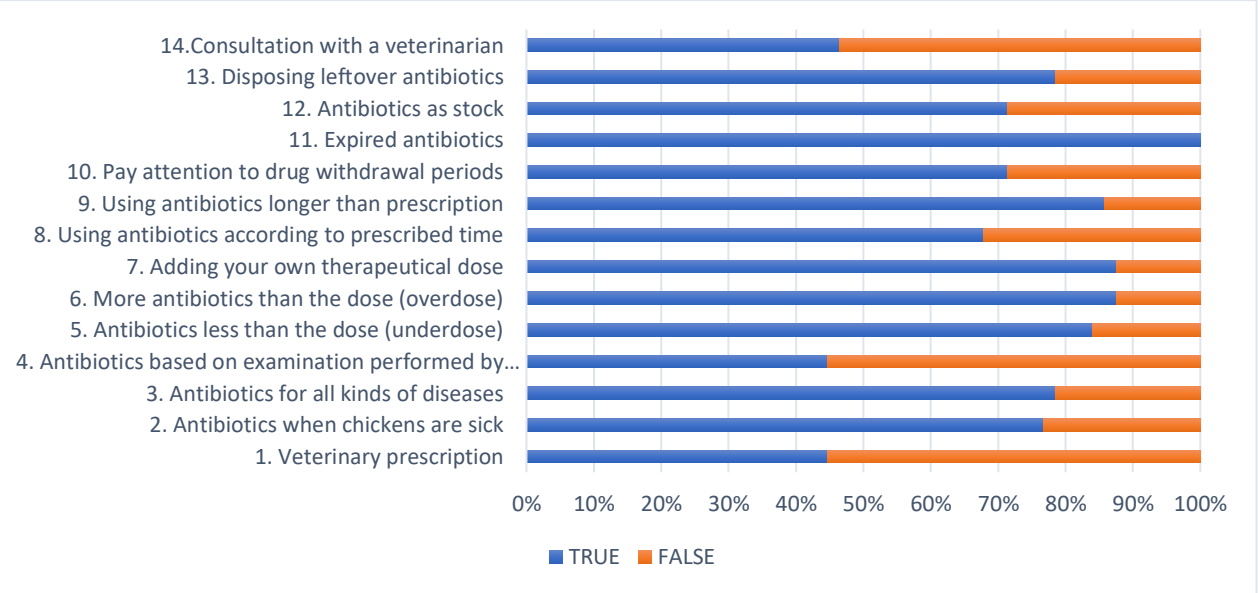

Figure 4. Respondents' Answer to the Practice Question

3.3. Relationship between Level of Knowledge, Attitudes, and Practices regarding Antimicrobial Use and Antimicrobial Resistance

Based on the paired correlation test (Pairwise comparison) between the values of the level of knowledge, attitudes, and practices, coefficient value of the relationship between knowledge and attitude was 0.560, between knowledge and practices was 0.586, between attitude and practices was 0.528. Based on the coefficient values, correlation between the level of knowledge, attitude, and practices was explained with positive moderate strength (coefficient value > 0.3-0.6) were found in each pair. Therefore, if one value is high, then the value of the other will tend to be high as well, and vice versa. The results of the correlation test between the level of knowledge, attitudes, and practices can be seen in Table 11.

Table 11. KAP Correlation

	Knowledge	Attitude	Practice
Knowledge		0.560	0.586
Attitude			0.528
Practice			

To find out the relationship between the level of knowledge, attitudes and practices of farmers who participated in the survey with the characteristics of respondents and farms catagorized based on education level, farming experience, type of farm and business scale, a chi-square test was carried out.

Based on the test results, no significant relationship was found between the level of livestock knowledge and education (p=p=0.071), farming experience (p=0.213), type of farm (p=0.696), and business scale (p=0.067). The complete test results are shown in Table 12.

Table 12. Relationship Between Knowledge and Characteristics of Repondents and Farms

Category	Good Knowledge		Moderate Knowledge		Poor Knowledge		Chi-Square Test (P Value)
	Total	Percentage	Total	Percentage	Total	Percentage	
Last Education Obtained							
Basic Education	5	13,2%	4	36,4%	4	57,1%	p=0,071
Secondary Education	22	57,9%	6	54,5%	2	28,6%	
Higher Education	11	28,9%	1	9,1%	1	14,3%	
Farming Experience							
< 11 years	10	26,3%	2	18,2%	4	57,1%	p=0,213

Category	Good Knowledge		Moderate Knowledge		Poor Knowledge		Chi-Square Test (P Value)
	Total	Percentage	Total	Percentage	Total	Percentage	
11-20 years	13	34,2%	2	18,2%	2	28,6%	
> 20 years	15	39,5%	7	63,6%	1	14,3%	
Farm Type							
Independent	36	94,7%	10	90,9%	7	100,0%	p=0,696 (*Fisher Exact*)
Partnership	2	5,3%	1	9,1%		0,0%	
Business Scale							
Small	21	55,3%	7	63,6%	7	100,0%	p=0,067 (*Fisher Exact*)
Medium	17	44,7%	4	36,4%	0	0,0%	

There was also no significant relationship between the attitudes of the respondents with level of education (p=0.160), farming experience (p=0.943), type of farm (p=0.634), and business scale (p=0.798). The complete test results are shown in Table 13.

Table 13. Relationship Between Attitude and Characteristics of Repondents and Farms

Category	Good Attitude		Moderate Attitude		Poor Attitude		Chi-Square Test (P Value)
	Total	Percentage	Total	Percentage	Total	Percentage	
Last Education Obtained							
Basic Education	4	16,0%	8	27,6%	1	50,0%	p=0,160
Secondary Education	17	68,0%	13	44,8%	0	0,0%	
Higher Education	4	16,0%	8	27,6%	1	50,0%	
Farming Experience							
< 11 years	7	28,0%	8	27,6%	1	50,0%	p=0,943
11-20 years	7	28,0%	10	34,5%	0	0,0%	
> 20 years	11	44,0%	11	37,9%	1	50,0%	
Farm Type							
Independent	23	92,0%	28	96,6%	2	100,0%	p=0,634
Partnership	2	8,0%	1	3,4%		0,0%	
Business Scale							
Small	15	60,0%	18	62,1%	2	100,0%	p=0,798
Medium	10	40,0%	11	37,9%		0,0%	

The practice of respondents in layer chicken farms was not significantly influenced by education (p=193), farming experience (p=0.115), and type of farm (p=0.930). A significant influence on the practice was associated with the scale of the business (p=0.010). This means that there is a relationship between the level of practice and business scale, the larger the business scale (medium scale), the better the level of practice. Among 35 small scale farms, 50% of farms are in good practices level and 85%

in moderate practices level. Meanwhile, among 21 medium-scale farms, 50% of farms are in good practices level and only 15% are in moderate practices levels (Table 14).

Table 14. Relationship Between Practice and Characteristics of Repondents and Farms

Category	Good Attitude		Moderate Attitude		Chi-Square Test (P Value)
	Total	Percentage	Total	Percentage	
Last Education Obtained					
Basic Education	8	22,2%	5	25,0%	p=0,193
Secondary Education	19	52,8%	11	55,0%	
Higher Education	9	25,0%	4	20,0%	
Farming Experience					
< 11 years	7	19,4%	9	45,0%	p=0,115
11-20 years	13	36,1%	4	20,0%	
> 20 years	16	44,4%	7	35,0%	
Farm Type					
Independent	34	94,4%	19	95,0%	p=0,930
Partnership	2	5,6%	1	5,0%	
Business Scale					
Small	18	50,0%	17	85,0%	**p=0,010**
Medium	18	50,0%	3	15,0%	

4. DISCUSSION

4.1. General Information

In terms of business scale, the majority of surveyed farms were included in the small-scale category with the type of independent farming. In small-scale farms, the animal health and rearing management were carried out by the owner himself to reduce production costs. This also includes the selection and determination antibiotic type to be used on the farm which was done by the owner with no medical background (81.5%).

The results of a survey conducted by Widiati (2017) on small-scale layer farms in Yogyakarta showed that farmers use feed, vaccines, vitamins, and disinfection based on leaflets given by suppliers, their farming experience, and lessons learned from other farmers. The CIVAS study (2014) on layer chicken farms in 3 districts in Central Java also found that in small-scale layer chicken farms almost all farms did not received supervision by veterinarians (97.5%) and veterinary paramedics (87.5%), therefore treatment decisions were determined by the farmers themselves (72.3%).

Respondents who consult with veterinarians in order to make decisions in using antibiotics on farms were 46.3% and 5.6% consult with animal health workers. Responding to the respondents' answer of high percentage of antibiotic use decision making made by veterinarians, this might happen because respondents consider almost all field personnel from veterinary pharmaceutical companies to be veterinarians. Meanwhile, we all know that not all field personnel from these companies are veterinarians and access to the veterinarian is difficult. In medium-scale farms, the veterinary health care generally come from internal farms themselves or from animal health workers from company partners/integrator company.

Farmers who choose and determine the types of antibiotics independently without having a background in veterinary medicine are using their knowledge and information obtained from their farming experience. Therefore, it is potential enough to cause inappropriate use of antibiotics and can have an impact on the incidence of AMR. Based on Minister of Agriculture Regulation No. 14 of 2017, the use of antibiotics must be based on a prescription obtained from a veterinarian and their use must be carried out by a veterinarian or animal health workers under the supervision of a veterinarian.

The use of antibiotics in the study farms was mostly for treatment purposes (69.2%). However, there was still use of antibiotics for prevention (30.8%) and no one used antibiotics to increase production or promote growth (Antimicrobial growth promoters). The use of AGP has been banned by the Indonesian government based on Minister of Agriculture Regulation No. 14 of 2017 regarding Classification of Veterinary Drugs. When

compared with the CIVAS study (2014) on layer chicken farms, the use of antibiotics for layer chicken by respondents was for treatment (97.5%), prevention (50%), and increase production (30%). Based on this report, the decrease in the use of antibiotics for treatment, prevention, and AGP purposes was recorded.

In a survey conducted by Directorate of Animal Health in collaboration with FAO, on broiler farms in 2017/2018 (877 farmers) and 2020 (542 farmers), the results of the survey found a decrease in using antibiotics for prevention from 81% to 74% and for treatment from 35% to 26%.

Based on information from Blitar and Malang district animal husbandry services, the use of antibiotics at the farmer level has been observed since there was no ban in 2018. Currently the usage has decreased because the change of farmer's paradigm. It is not only about antibiotics, but product assurance needs to be carried out and synergized through product improvement and quality assurance program.

When connected purpose of using antibiotics in farms with the characteristics of respondents and farms, especially in the category of level of education, experience in farming, type of farm, and business scale; based on the results of the chi-square test, no significant relationship was found with a $p > 0.05$. According to Coyne et al. (2019), factors that drive the use of antimicrobials in farming system are influenced by farm profitability, disease prevention, and reduced mortality rates. Veterinary service providers have an important role to play in influencing the prudent use of antimicrobials and reducing the emergence and spread of antimicrobial resistance globally (Afakye et al. 2020).

In an effort to reduce the incidence of disease and reduce the mortality rate in livestock, prevention can be done by implementing an effective biosecurity program, good hygiene practices, and following a comprehensive vaccination program. According to Cobb (2021), the best disease prevention is by implementing an effective biosecurity program and carrying out vaccinations.

Respondents obtained information about antibiotics and their use from various sources, starting from drug companies, livestock services, training or seminars, other farmers, conventional socialization media, the internet and social media. Even though there have been many sources of information, half of the respondents (50%) stated that they still did not have sufficient sources of information about antibiotics and their use. The most information about antibiotics was obtained from drug companies which reached 78.6%. This high percentage means that the role of veterinary drug companies is needed in educating their technical services personnel and also educating livestock about the responsible and prudent use of antibiotics.

Most of the surveyed farms (70.4%) obtain antibiotics from poultry shop (Sapronak)/veterinary drug stores. This finding might be caused by the scale of the farm, in which are small scale farms in majority. Minister of Agriculture Regulation No. 45 of 2019 stipulates that depot businesses, pet shops, poultry shops, and veterinary drug stores that already have a business license in conducting their business must have veterinarians or pharmacists who work non-permanently, or veterinary paramedics who work under the supervision of veterinarians who remained in charge of technical responsibility. However, based on the survey, more than half of the respondents (55,4%) did not use antibiotics based on the results of examinations from veterinarians or purchased antibiotics using a prescription from a veterinarian. Therefore, it is very likely that not all poultry shop (sapronak)/veterinary drug stores have veterinarians, pharmacists, or veterinary paramedics who work under the supervision of veterinarians. Easy access to antibiotics has the potential to cause antibiotic misuse. According to Coyne et al. (2020) many farmers use antibiotics in broilers because antibiotics are very easy to obtain, while advice from veterinarians is difficult to access. For this reason, the government should pay attention by increasing supervision of and training for poultry shop/animal drug store in the sale and distribution of antibiotics as well as facilitating access for farmers to veterinarians.

Based on this situation, education and raising awareness regarding the use of antibiotics and AMR are urgently needed, especially for layer farm owners in order to increase level of knowledges, attitudes, and good practices on the farm. In its implementation, the involvement of various stakeholders is needed, especially from drug companies, and civil society/professional organizations. The use of socialization media, social media, and the internet can also be used in the delivery of IEC. However, a communication strategy and IEC materials must be developed in accordance with the goals and objectives of the information that need to be conveyed. In layer chicken farms there are more independent farms, so the approach will be different from conducting education on industrial broiler farms. In addition, interventions with a social science approach are also needed to motivate behavior change towards antimicrobial use habits (Speksnijder and Wagenaar, 2018).

4.2. Knowledge, Attitudes, and Practices regarding Antimicrobial Use and Antimicrobial Resistance

Most farmers' level of knowledge are categorized in good (67,9%) and moderate (19,6%) level instead of poor (12,5%). Afakye et al. 2020, states that knowledge will shape good practice of using antibiotics on farms.

Regarding the knowledge about antibiotics and their use, attention need to be given in several findings, in which are lack of understanding that antibiotics should only be used

after a clinical examination by a veterinarian and antibiotics are only can be purchased/obtained through a veterinary prescription. Even though farmers have understood that antibiotics cannot be used for all types of diseases, antibiotics are still found to be used to treat diseases caused by viruses, and also used for disease prevention. Deliverables of these topics need to be strengthened in the future AMU IEC materials.

Farmers also understand that antimicrobial resistance is a condition where microbes are resistant to treatment. AMR can occur due to inappropriate dosage, duration of use, and combination of antibiotics. AMR is a health problem faced in Indonesia. However, farmers still do not understand that transmission of resistant bacteria to animals or humans can occur through infected animals, contaminated animal products, and the environment. Increasing farmer's knowledge about how resistant bacteria can be developed and spread between animals, humans, and the environment is essential to be done.

The attitudes of farmers in majority are classified as moderate (51,8%) and good (44,6%). The attitude of the respondents is still in the moderate category, but there has been a change in attitude towards the good category. Respondents had a negative attitude (disagree and strongly disagree) towards the statement "animals infected with resistant bacteria can transmit their resistance to farmers and their families and can contaminate chicken products which have an impact on human health." Farmers still think that resistant bacteria cannot be transmitted to humans. This situation is in line with farmer's lack of understanding on transmission of resistant bacteria to animals or humans either through animals, contaminated animal products, and the environment. The hope is that by increasing knowledge, the attitude of respondents will also increase.

Practices carried out on farms were categorized as good (65.3%) and moderate (35.7%). However, attentions need to be given to several matters regarding the practices carried out on farms since there are still many respondents who use antibiotics not based on the results of a veterinarian's examination, buy/obtain antibiotics without veterinary prescription, use antibiotics without following time schedule, and do not contact the same veterinarian when the chicken does not recover. It is necessary to provide guidance to farmers, Poultry Shop (Sapronak)/ veterinary drug stores, and other related parties to improve the identified poor risk behaviours on buying and using antibiotics.

4.3. Relationship between Level of Knowledges, Attitudes, and Practices regarding Antimicrobial Use and Antimicrobial Resistance

In the survey, it was found that there was a correlation between knowledge, attitudes, and, practices with positive moderate strength (coefficient value > 0,3-0,6), which means that good knowledge about the use of antibiotics and understanding of AMR will

have the influence in order to increase positive attitudes and to change practice of using antibiotics towards good direction. In partnership type of layer farms, the practices carried out may not be in line with the knowledge and attitudes of farmers. This could be due to farm production facilities including medicines and health programs coming from the parent company.

The findings in this KAP survey are in line with a study conducted by Purnawarman et al. (2020) on broiler farms in Subang Regency, who found a significant relationship between farmers' knowledges, attitudes, and practices in using antibiotics in broilers. Studies on layer farms in Ghana and Kenya also found that knowledge will shape good antibiotic use practices by farmers (Afakye et al., 2020). In addition, a review conducted by Wall (2019) found that people who have less knowledge and awareness tend to self-medicate, which can lead to antibiotic resistance.

On the relationship between knowledge and attitudes regarding the antibiotic use in farmers with the characteristics of respondents and farms based on categories of education level, farming experience, type of farm, and business scale; the test results show no significant relationship with the value of $p > 0.05$.

The study conducted by Walyani (2019) shows the contrast result. It shows that the factors affecting farmers's level of knowledge are also including formal education and length of farming time. The higher the level of formal education, the higher the knowledge level of the farmer. The longer they have been doing the business, the more information and experience the farmer will get.

From the relationship between the farmer's antibiotic usage practice and the characteristics of the respondents and the farm, a significant relationship between the practice and the scale of the livestock business can be seen ($p=0.010$). However, there was no significant relationship ($p>0.05$) found between practice and education, farming experience, and type of husbandry. These results indicate that the bigger scale of a business, the practices level will tend to be better. This is possible because a bigger business scale will have better supporting facilities and infrastructure and can improve farm management practices to be better.

Based on the result, in order to improve the practices of antibiotic use and to hold down antimicrobial resistance incidence rate in the field, it is necessary to increase knowledge, emphasizing more on the identified weaknesses of farmers' knowledge and fostering attitudes of farmers, poultry shop/animal drug store, as well as other related parties with Information, Education, and Communication (IEC) delivery methods adapted to the goals and objectives to be achieved.

5. CONCLUSIONS

Some conclusions from the results of this KAP survey are:

1. Respondents have good and moderate level of knowledges, attitudes, and practices.
2. There is a correlation between the values of the level of knowledges, attitudes and practices with positive moderate strength which means that good knowledge about the use of antibiotics and understanding of AMR will have the influence in increasing positive attitudes, and in changing practice of antibiotic use towards good direction.
3. The level of knowledge and attitude is not significantly related to the level of education, experience in farming, type of farm, and business scale. However, practice has a significant relationship with business scale.
4. Increasing knowledge about the use of antibiotics is needed, especially about:
    a. The use of antibiotics is only carried out after a clinical examination by a veterinarian.
    b. Antibiotics can only be purchased/obtained with a doctor's prescription.
    c. Antibiotics should not be used for disease prevention and as growth promoters.
    d. Antibiotics should not be used to treat diseases caused by viruses.
5. Increasing knowledge about AMR regarding how resistant bacteria can develop and spread between animals, humans, and the environment is important.

6. RECOMMENDATIONS

1. Educate and raise awareness regarding antibiotic use and AMR among farmers, technical services personnel from veterinary pharmaceutical companies, and poultry shops/animal drug stores.
2. Introduce peer education system among farmers by identifying farmers having good knowledge, attitude and practices as leaders and utilize them to educate fellow farmers.
3. Introduce a reward system to enhance antimicrobial free chicken and egg
4. Enhance knowledge and awareness about antibiotic use and AMR by involving various stakeholders, including veterinary pharmaceutical companies, commercial poultry farms, and organizations/associations in the poultry sector.
5. Strengthen supervision and guidance in poultry shops/animal drug stores regarding the sale and distribution of antibiotics to farmers.
6. Conduct more studies or surveys on farms regarding the level of antimicrobial use and the impact of AMR to gain a better understanding of antimicrobial usage patterns and their socio-economic influences on farms.
7. Consider public private partnership model for sustainable improvement of awareness.

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ATTACHMENTS

Attachment 1. KAP Survey Questionnaire

CONFIDENTIAL

QUESTIONNAIRE

Survey of Knowledge, Attitudes and Practices (KAP) on the Use of Antimicrobials in Farm

Joint Assessment on Implementation of AMU Stewardship in Selected Poultry Farms and Communities Through Knowledge Attitude Practices Survey (KAP) in Indonesia

WOAH MPTF AMR

Farm Visit Date:	Enumerator Name:	Farm Code	Farm Category

1. General Information

A. Respondent's Data

1) Respondent Name :
2) Gender : ☐ Male : ☐ Female
3) Age : year
4) Highest education completed Education :
5) Farming experience : year
6) Phone number :
7) Position on the farm : ☐ Owner ☐ Animal health manager

B. Farm's Data

1) Name of Farm :
2) Name of the owner :
3) Farm address :
4) Coordinate point : **Latitude:** **Longitude:**
5) Type of farm : ☐ Independent ☐ Partnership
6) Farm's Area : m^2
7) Total Number of Houses : houses
8) Populations :
9) Farm's Capacity :
10) Rearing Type : ☐ DOC ☐ Pullet

C. The Basic of Antibiotic Use

No	Question	Choice
1.	Do you use veterinary drugs? Can you tell or show the product? *if **no,** then continue to the questions in **Part D** (source of information)	☐ Yes, drug's brand…. ☐ No*, Reason …..
2.	If you use veterinary drugs, do you understand that they are considered as antibiotic?	☐ Yes ☐ No
3.	Purpose of antibiotic use	☐ Prevention ☐ Treatment ☐ Growth promoter
4.	Source of getting antibiotics	☐ Veterinarian ☐ Animal health officer ☐ Veterinary drug company ☐ Poultry shop ☐ Another Farmer
5.	Decision maker for the antibiotic use	☐ Veterinarian

		☐ Animal health officer ☐ Owner ☐ Farm worker ☐ Another Farmer

D. Sources of information about the use of antibiotics

No	Question	Answer
1.	Is knowledge about antibiotics and its use in farm very important?	☐ Yes ☐ No
2.	Have you ever received an explanation about antibiotics and the usage after the last survey by FAO?	☐ Never ☐ 1-3 times ☐ > 3 times
3.	Sources of information about antibiotics:	
	1) Livestock services	☐ Yes ☐ No
	2) Drug company	☐ Yes ☐ No
	3) Another farmer	☐ Yes ☐ No
	4) Training/seminars/events etc.	☐ Yes ☐ No
	5) Internet	☐ Yes ☐ No
	6) Socialization media (posters/brochures/leaflets etc.)	☐ Yes ☐ No
	7) Others, Specify ……	
4.	According to you, do you have enough sources of information about using antibiotics when you need?	☐ Yes ☐ No

2. Knowledge on antibiotic use

The target of the questions below are limited only to chickens

No	Question	Yes	No	Annotation
		Value: 1	Value: 0	
1.	Please mention antibiotics that you know			
2.	Antibiotics can only be used after clinical checkup performed by veterinarian			
3.	Antibiotics can only be obtained with prescription from doctor			
4.	Antibiotics can not be used as preventive measures for the disease			
5.	Antibiotics can be used to treat all kind of diseases			
6.	Disease can be caused by bacteria and virus			
7.	Antibiotics can not be used to treat viral disease such as avian influenza or gumboro.			
8.	Inappropriate use of antibiotics can cause ineffective treatment in the future.			
9.	Long-term use of the same antibiotic can cause the decrease in the effectiveness of the antibiotic in the future.			
10.	Antimicrobial resistance is a condition in which the microbes become resistant / cannot respond to antibiotic treatment.			
11.	Resistant bacteria can be transferred to animals/humans through the other animals that are infected by the resistant microorganisms.			
12.	Resistant bacteria can be transferred to animals or humans through contaminated animal products.			
13.	Resistant bacteria can be transferred to animals or humans through the environment.			
14.	Doses of antibiotics that are not in accordance with prescriptions or drug label can affect the occurrence of antibiotic resistance.			
15.	Duration of antibiotics administration that are not in accordance with prescriptions or drug label can affect the occurrence of antibiotic resistance			
16.	The use of combination antibiotics that are not in accordance with the prescription can affect the occurrence of antibiotic resistance.			

No	Question	Yes	No	Annotation
		Value: 1	Value: 0	
17.	Antimicrobial resistance is a health problem currently being faced by Indonesia.			

3. Attitude on antibiotic use

No	Statement	Completely agree	Agree	Neutral	Disagree	Completely disagree
		Value: 5	Value: 4	Value: 3	Value: 2	Value: 1
1.	Antibiotics can only be used after veterinary examination					
2.	Antibiotics can be used based on the advice from other farmers without veterinary consultation.					
3.	Animal health examination cost conducted by veterinarian is expensive					
4.	Using leftover antibiotics that are not used on the farm will save costs.					
5.	The use of antibiotics can help save chickens even if the rearing management is not good, for example, low biosecurity level (rarely cleaned house, and uncontrolled/free human movement).					
6.	Antibiotics are still given within the specified time according to					

No	Statement	Completely agree	Agree	Neutral	Disagree	Completely disagree
		Value: 5	Value: 4	Value: 3	Value: 2	Value: 1
	the prescription/label, even if the chicken shows signs of recovery.					
7.	Improved biosecurity can reduce the use of antibiotics.					
8.	The use of vaccines can reduce the use of antibiotics.					
9.	Reducing the use of antibiotics will increase income for the farm.					
10.	Reducing the use of antibiotics will reduce production yields (higher mortality, higher FCR, lower growth rate).					
11.	Reducing the use of antibiotics will reduce livestock health.					
12.	Reducing the use of antibiotics will contribute to a decrease in the level of antibiotic resistance					
13.	With your current farming experience, can reduce the use of antibiotics on your farm					
14.	Animals infected with resistant bacteria can transmit the resistance to farmers and their families					
15.	Resistant bacteria can contaminate chicken products					

No	Statement	Completely agree	Agree	Neutral	Disagree	Completely disagree
		Value: 5	Value: 4	Value: 3	Value: 2	Value: 1
	which have an impact on human health.					

* Score of positive statement : CA=5, A=4, N=3, D=2, CD=1
* Score of negative statement : CA=1, A=2, N=3, D=4, CD=5

4. Practices on antibiotic use

No	Question	Always	Often	Sometimes	Never
1.	You buy antibiotic with a veterinarian's prescription				
2.	You use antibiotics only when the chicken shows symptoms of illness				
3.	You always use antibiotics to treat all diseases in chickens				
4.	You use antibiotics based on veterinarian's diagnosis				
5.	You use antibiotics less than the dose recommended by vet or label				
6.	You use antibiotics more than the dose recommended by vet or label				
7.	You increase the dose of medication when the chicken does not recover after the treatment has given				
8.	You continue to use antibiotics according to the time specified by the prescription / label even though the chicken looks better				

9.	You will use antibiotics longer than the number of days prescribed if the chicken has not recovered.				
10.	You stop using the antibiotic according to the drug's withdrawal time of the label before harvesting / rejecting period				
11.	You use expired antibiotics with good packaging.				
12.	You keep antibiotics as stock on the farm				
13.	You throw unused antibiotics into the trash or public sewer				
14.	You consult the same vet if the chicken does not recover after the prescribed treatment period				

* Score of positive statement : Always=4, Often=3, Sometimes=2, Never=1
* Score of negative statement : Always=1, Often=2, Sometimes=3, Never=4

Attachment 2. Documentations

Coordination with the Department of Livestock and Animal Health Services in Malang District

Coordination with the Department of Livestock and Fisheries in Blitar District

Signing Process of the Informed consent form by Layer Chicken Farmer in Malang District

Interview Session with Layer Chicken Farmer in Malang District

Pengisian form persetujuan wawancara Peternakan Ayam Layer di Kabupaten Malang

Wawancara Peternakan Ayam Layer di Kabupaten Malang

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