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Knowledge, Attitude and Practice of Animal Owners Towards Antimicrobial Use and Antimicrobial Resistance in Farta Woreda, South Gondar Zone, Ethiopia

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Abstract: A cross-sectional study design was employed to assess the knowledge, attitudes and practices (KAP) on AMR and AMU among the community of Farta District from July 2022 to September 2022. The study population was 251 animal owners that were found in farta woreda and were randomly selected. There was a higher number (72.1%) of male participants than females (27.9%. The highest number (55%) of the participants was not educated (illiterate) and others were literate. The most commonly used antimicrobials were Albendazole, oxy tetracycline and pen-strip. 153(60.9 %) of the respondents had no information about antimicrobials. The majority of the respondents, 161(64.1%), had never heard of antimicrobial resistance in humans and animals. Regarding the knowledge about antimicrobial use, 34.7%, 18.3% and 13.1% of respondents were aware that antimicrobials are useful for treating, prevention and for both (treating and preventing) of disease, respectively. Also, 33.9% of the respondents had not known the use of antimicrobials. About knowledge of vaccines, 33.1% of the respondents were aware that vaccines are administered as a preventive measure but 16.7% for treatment 11.2% for treatment and prevention and 38.2% do not know the use of vaccine. Most animal owners use antimicrobials but do not use them properly. If the antimicrobials in their hands or those they bought for some reason are expired, 53.8% will use them when needed, 24.7% will not use them and 21.5% will throw them away. The main sources of veterinary drugs for livestock owners were 12% open market, 8.4% any shop, 17.5% Vet pharmacies, 6.8% human pharmacies, 8.4% Vet clinics, 15.9% traditional practitioner, 21.5% Private veterinarian and 9.6% Government animal healthcare provider. This study has revealed a gross lack of awareness of health threats associated with antimicrobial use and resistance among the farming communities posing serious public health threats in Farta Woreda.

Key words: Antimicrobial · Antimicrobial Resistance · Attitude · Knowledge · Practice

INTRODUCTION

An antimicrobial is an agent that kills microorganisms or stops their growth. Antimicrobial medicines can be grouped according to the microorganisms they act primarily against. For example, antibiotics are used against bacteria and antifungals are used against fungi. They can also be classified according to their function. Agents that kill microbes are microbicides, while those that merely inhibit their growth are called bacteriostatic agents. The use of antimicrobial medicines to treat infection is known as antimicrobial chemotherapy, while the use of antimicrobial medicines to prevent infection is known as antimicrobial prophylaxis [1].

Antimicrobial products kill or slow the spread of microorganisms. Microorganisms include bacteria, viruses, protozoans and fungi such as mold and mildew. Antimicrobial Resistance (AMR) occurs when bacteria, viruses, fungi and parasites change over time and no longer respond to medicines, making infections harder to treat and increasing the risk of disease spread, severe illness and death. As a result of drug resistance, antibiotics and other antimicrobial medicines become ineffective and infections become increasingly difficult or impossible to treat. AMR occurs naturally over time, usually through genetic changes [2].

The main classes of antimicrobial agents are disinfectants (non-selective agents, such as bleach),

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which kill a wide range of microbes on non-living surfaces to prevent the spread of illness, antiseptics (which are applied to living tissue and help reduce infection during surgery) and antibiotics (which destroy microorganisms within the body). The term "antibiotic" originally described only those formulations derived from living microorganisms but is now also applied to synthetic agents, such as sulfonamides or fluoroquinolones [3]. Though the term used to be restricted to antibacterials (and is often used as a synonym for them by medical professionals and in medical literature), its context has broadened to include all antimicrobials. Antibacterial agents can be further subdivided into bactericidal agents, who kill bacteria and bacteriostatic agents, which slow down or stall bacterial growth. In response, further advancements in antimicrobial technologies have resulted in solutions that can go beyond simply inhibiting microbial growth. Instead, certain types of porous media have been developed to kill microbes on contact [4].

They can spread from person to person or between people and animals, including through food of animal origin. The main drivers of antimicrobial resistance include the misuse and overuse of antimicrobials; lack of access to clean water, sanitation and hygiene for both humans and animals; poor infection and disease prevention and control in health-care facilities and farms; poor access to quality, affordable medicines, vaccines and diagnostics; lack of awareness and knowledge; and lack of enforcement of legislation. Antimicrobial resistance (AMR) is a global health and development threat. It requires urgent multispectral action to achieve the Sustainable Development Goals (SDGs). WHO has declared that AMR is one of the top 10 global public health threats facing humanity. Misuse and overuse of antimicrobials are the main drivers in the development of drug-resistant pathogens. Lack of clean water and sanitation and inadequate infection prevention and control promote the spread of microbes, some of which can be resistant to antimicrobial treatment. The cost of AMR to the economy is significant. In addition to death and disability, prolonged illness results in longer hospital stays, the need for more expensive medicines and financial challenges for those impacted. Without effective antimicrobials, the success of modern medicine in treating infections, including during major surgery and cancer chemotherapy, would be at increased risk [2].

Objectives: The emergence of antimicrobial resistance is a growing human and animal health concern around the world. While several studies have emphasized the Knowledge, Attitude and Practice (KAP) regarding antimicrobial use and resistance in humans, little attention has been paid to the veterinary sector. The objective of this study was To assess the level of knowledge, attitudes and practices (KAP) of the community toward AMR and AMU in Farta Woreda, South Gondar Zone, Ethiopia.

MATERIALS AND METHODS

Study Area: Farta Woreda is located in the south Gondar Administrative Zone of the Amhara National Regional State, Ethiopia (Figure 1). It is about 100km north of the Regional Capital, Bahir Dar and 660 km north of Addis Ababa. The total area of the Woreda is 109, 925 hectares [5].

Farta is bordered on the south by Misraq Este, on the west by Fogera, on the north by Ebenat and the east by Lay Gayint. The town of Debre Tabor is surrounded by Farta. Based on the 2007 national census conducted by the Central Statistical Agency of Ethiopia (CSA), this woreda has a total population of 232, 181, an increase of 1.49% over the 1994 census. The largest ethnic group reported in Farta was the Amhara (99.95%). Amharic was spoken as a first language by 99.96% and 99.57% of the population practiced Ethiopian Orthodox Christianity [5]. The livestock population of this woreda is 213, 188 bovines, 165, 534 sheep, 36, 072 equine and 132, 050 poultry [6].

Study Design and Study Period: A cross-sectional study design was employed to assess the knowledge, attitudes and practices (KAP) on AMR and AMU among the community of Farta District from July 2022 to September 2022.

Study Population: The study population was animal owners who had lived in randomly selected woredas of the South Gondar zone in the Farta district as permanent residents for more than six months. Both males and females with the age group above 18 years were included in this study.

Sample Size Determination and Sampling Techniques: The required sample size for this study was estimated by considering 50% of the population knowing about AMR and AMU since earlier there is no KAP study on AMR and AMU in the study area. Thus, the sample size was calculated according to the Thrufield formula by using a 95% confidence interval and 0.05 absolute precision [7] as follows:

Fig. 1: Map of study area

$$N = \frac{1.96^9 P_{exp}(1 - P_{exp})}{d^2}$$

where N = required sample size; Pexp = Expected proportion of population knowing about rabies are 50%; d^2 = Desired absolute precision (0.05). As a result, 384 respondents were selected as the study population, but due to the shortening of the working time, the total sample size was 251 individuals.

Data Collection: Structured questionnaire interviews were conducted to assess the knowledge, attitude and Practice (KAP) of AMU and AMR of animal producers in the south Gondar zone, farta woreda. The questionnaire was developed in English primarily and then translated into the local language (Amharic). The largest open livestock market and veterinary clinics were chosen and the animal producers were invited for interview. All animal producers, regardless of their educational status and sex, were included as information sources for the study. A questionnaire developed by Tenaw from FAO was administered to 251 livestock owners in a face-to-face mode. At the start of the interview, the respondents were advised of the survey's objectives;

The questionnaire comprised five different sections. Demographic information such as age, sex and educational level was obtained in the first section (Table 1). In the second section, antimicrobial use of respondents (Table 2). The third, fourth and fifth sections consisted of questions related to knowledge (6 questions), attitudes (3 questions) and practices (11 questions) related items, respectively.

Inclusion and Exclusion Criteria: Animal owners who live more than 6 months as permanent residents in the study area were included in this study and households who live less than six months and less than 18 years were excluded from this study.

Data Management and Analysis: After collecting, the data were cleaned and checked for completeness. Those incomplete and inconsistent were corrected when possible and removed otherwise. After a complete check-up, the data were coded and entered into a Microsoft Excel sheet and analyzed. Descriptive statistics were computed to describe the animal owners' demography. Six items were used to assess farmers' knowledge (n = 6), attitudes (n = 3) and practices (n = 11) related to antimicrobial use and resistance. The outcomes concerning knowledge, attitude and practice were initially multiple-choice "yes or no.

Ethical Clearance: The study protocol was reviewed and approved by the Ministry of Agriculture in collaboration with the Food and Agriculture Organization of the United Nations (FAO); Oral informed consents were obtained from each participant after informing them about the purpose of the study as well as the risks, benefit and

rights of the study participants. Only voluntary participants were involved in the study. All the information obtained from the study participants was kept confidential.

Data Quality Assurance: Before the beginning of the full study, the pre-test was performed on some participants to see the applicability of the questionnaire. Each questionnaire was checked for incompleteness, missed values and unlikely responses and then manually cleaned upon such indications. The data was cross-checked for consistency and accuracy.

RESULTS

Demographic Characteristics of the Animal Producers: 51% of the respondents were in the age group of 31–40 years. There was a higher number (72.1%) of male participants than females (27.9%). In the study area, all respondents reared all food animals. The highest number (55%) of the participants was not educated (illiterate) and others attended primary to secondary education levels. The details of the demographic characteristics of the respondents are described in Table 1.

Common Antimicrobials Used by Animal Owners During the Study: The most commonly used antimicrobials were Albendazole, oxytetracycline and pen-strip. Although most of the above-mentioned drugs are mainly used, some farmers also use other drugs like penicillin and sulfa drugs.

The most common diseases encountered in the study area were Bloody diarrhea or Dysentery and Foot and mouth disease (FMD), as indicated in Table 2.

The Knowledge of Animal Owners Towards AMU and AMR: It was found that a large proportion of the farmers participting in the survey had Inadequate information about antimicrobials and those they used antimicrobials inappropriately. Among the animal breeders who were asked, 98 (39.1 %) of participants responded that they have recognition and 153(60.9 %) of that they have no recognition about antimicrobials.

From all respondents in the study 90(35.9 %) of respondents had heard about AMR and 161(64.1 %) had never heard of antimicrobial resistance in humans and animals. The majority of animal producers, 155 (61.8 %), know about what vaccination for animals is and 96(38.2 %) of the animal producers were not aware of what vaccination for animals is. When they asked what vaccination do 85(33.9 %) of respondent response for Prevent animals from becoming sick, 42(16.7 %) response to cure sick animals and 28(11.2 %) of respondent response is for both (for Prevent animals from becoming sick, to cure sick animals) and 96 (38.2 %) respondent have not knowledge about vaccine.

Regarding the knowledge about antimicrobial use, 34.7%, 18.3% and 13.1% respondents were aware that antimicrobial are useful for treating, prevention and for both (treating and preventing) of disease respectively. Also, 33.9% of the respondents had not known the use of antimicrobials. About knowledge of vaccines, 33.1% of the respondents were aware that vaccines are administered as a preventive measure but 16.7% for treatment, 11.2% for both and 38.2% do not know the use of vaccine.

Attitudes of Animal Owners Towards AMU and AMR: The descriptive results for the responses to questions relating to farmers' attitudes are summarized in Table 4.

Regarding to the reason of that antimicrobials not working, 35% of them not know the reason, 21.1% response due to problem of Hygiene, improper feeding of animal, 15.9% response due to poor diagnosis and treatment with AMs, 21.9% response due to Use of poor quality or Illegal sources and 6% response due to Improper administration. In the study area 9.6% of information provider were Veterinarian or animal health worker, 13.1% of Veterinary pharamcy, 32.7% of pharmacy professional in Pharmacy, 8.4% of the Pharmaceutical or feed distributer company, 16.7% of traditional medicine practitioner, 11.2% of other farmer and 8.4% of own experiences were considered to be the most adviser or information providers for animal owners in the study area to administer antimicrobials.

Most animal owners use antimicrobials but do not use them properly. If the antimicrobials in their hands or those they bought for some reason are expired, 53.8% will use them when needed, 24.7% will not use them and 21.5% throw away.

Practices of Animal Owners Towards AMU and AMR: As shown the Fig. 5 the main sources of veterinary drugs for livestock owners were 12% open markets, 8.4% any shop, 17.5% Vet pharmacies, 6.8% human pharmacies, 8.4% Vet clinics, 15.9% traditional practitioner, 21.5% Private veterinarian and 9.6% Government animal healthcare provider.

Table 1: Animal owner demographic characteristics

Characteristics	Categories	Frequency	Percent (n = 251)
Age	18-30	38	15.1
	31-40	128	51.0
	>40	85	33.9
Sex	Male	181	72.1
	Female	70	27.9
Educational level	Illiterate	138	55.0
	Primary school	49	19.5
	Secondary school	64	25.5

Table 2: Diseases encountered and Antimicrobials used in the study area

Diseases Encountered and Antimicrobials You know.	Yes	No	Local name of the medicine
Diseases/symptoms often encountered			
Pneumonia	85	166	Sal
Bloody diarrhea or Dysentery	170	81	Tekimat
TB	0	251	Amenmin
Trypanosomiasis	62	189	Wezewuz
Foot and mouth disease (FMD)	152	99	Aftegir
Antimicrobials you know			
Penicillin	42	209	Awuraris
Pen-strept	162	89	Nech
Oxy tetracycline	178	73	Keyu
Sulfa drug	22	229	Wuhamelk
Albendazole	251	0	Madaberya

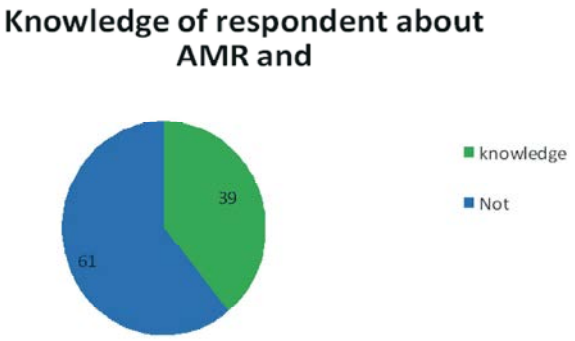

Fig. 2: Knowledge of respondents about AMR and AMU

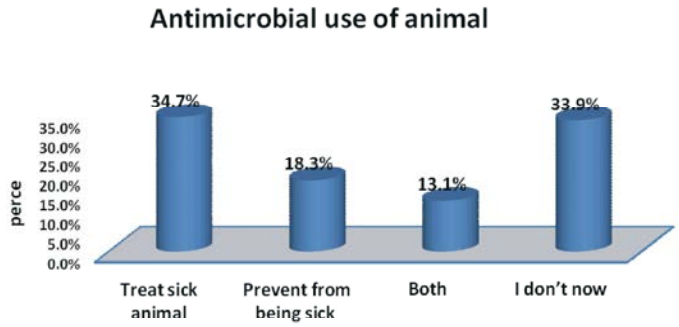

Fig. 3: Antimicrobial use of animal owner

From the total interviewed animal owners, 103(43%) respondents did not administer the full dose and course of the antimicrobials as recommended. This is due to 38 (15.1 %) not having sufficient money and 65(25.9%) believing that it is sufficient. 166 (66.1%) respondents used antimicrobials for their animals for the last one month; the rest, 85(33.9%) of respondents not use AM for last one month but they use before the last one month.

Table 3: Knowledge of animal owners about AMR and AMU

Knowlodge related items (n=251)		Frequency	% of respondant
Do you know what antimicrobials mean?	Yes	98	39.1
	No	153	60.9
Why do you use antimicrobials?	Treat sick animal	87	34.7
	Prevent from being sick	46	18.3
	Both	33	13.1
	I don't now	85	33.9
Have you heard /know about antimicrobial resistance?	Yes	90	35.9
	No	161	64.1
Do you know that antimicrobials that are used to work in treating infections in animals may not work if not use properly	Yes	155	61.8
	No	96	38.2
Do you know what vaccinations for animals?	Yes	155	61.8
	No	96	38.2
What vaccinations do?	Prevent animals from becoming sick	85	33.9
	Cure sick animals	42	16.7
	Both above	28	11.2
	I don't now	96	38.2

Table 4: Attitude of animal owner toward AMR and AMU

Attitude related items(n=251)		Frequency	% of respondents
Who advised you or provided information to administer antimicrobials?	Veterinarian or animal health worker	24	9.6
	Veterinary Pharamcy	33	13.1
	Pharmacy professional in Pharamcy	82	32.7
	The Pharamceutical or feed distributer	21	8.4
	Traditional medicine practitioner	42	16.7
	Other farmer	28	11.2
	Own experiances	21	8.4
If the antimicrobaials in your hands or those for some reason bought are expired, what do you do with them?	will use them when needed	135	53.8
	will not use them	62	24.7
	throw away	54	21.5
	return back to where you bought	0	0.0
	Do not know	88	35.1
	problem of Hygiene, improper feeding	53	21.1
What do you think that antimicrobials not working?	poor diagnosis and treatment with AMs	40	15.9
	Use of poor quality or Ilegal sources	55	21.9
	Improper administration	15	6.0

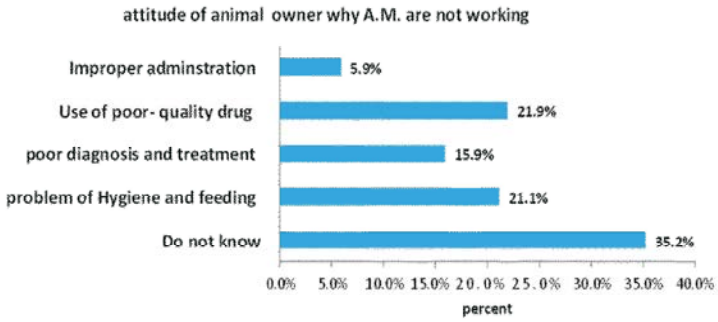

Fig. 4: Attitudes of animal owners toward AMU and AMR

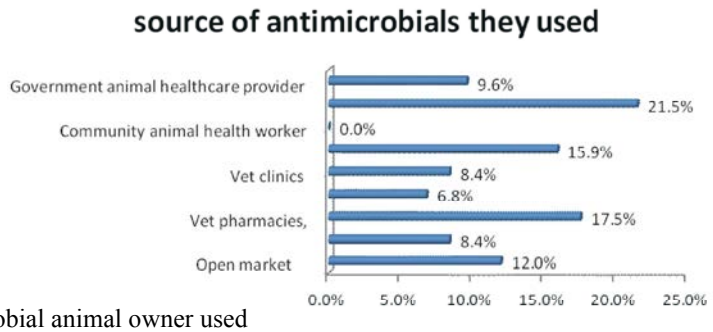

Fig. 5: Sources of antimicrobial animal owner used

Fig. 6: Challenges of animal owner to treat their animal

Table 5: Practice of animal owner toward AMU and AM

Practice related items (N=251)		Frequency	% of respondant
Have you ever used antimicrobials for your animals the last one month?	Yes	166	66.1
	No	85	33.9
How do you get the medicines	prescribed by healthcare provider	82	32.7
	self-selected	125	49.8
How frequent do you use antimicrobials	once	110	43.8
	2--5 times	78	31.5
	More than 5 times	63	24.7
What are the sources of antimicrobials you used?	Open market	30	12.0
	Any shop	21	8.4
	Vet pharmacies,	44	17.5
	human pharmacies	17	6.8
	Vet clinics	21	8.4
	Traditional practitioner	40	15.9
	Community animal health worker	0	0.0
	Private veterinarian	54	21.5
	Government animal healthcare provider	24	9.6
Do you administer the full dose and course of the antimicrobials as recommended?	Yes	148	59.0
	No	103	41.0
Why not Do you administer the full dose and course of the antimicrobials as recommended?	Have no sufficient money	38	15.1
	Believed that it is sufficient	65	25.9
	Advised by others	0	0.0
Do you hoard antimicrobials for later use other than the current use	Yes	152	60.6
	No	99	39.4
On average, how often did you encounter illnesses in any of your animals? per month/year	1 times	131	52.2
	2 times	76	29.9
	3 times	44	17.5
Whatdid you do when your animal are sick?	Do nothing	0	0.0
	Go to government animal health clinic	84	33.5
	go to the private vet clinic	77	30.7
	Go to any shop and buy medicines	43	17.1
	Use traditional medicines	47	18.7
	Do nothing	0	0.0
	Go to government animal health clinic	84	33.5
Have you had any recurrences or difficulties in treating animals	Yes	251	100.0
	No	0	0.0
What are the challenges do you face in treating your animals	No animal health provider nearby	64	
	No medicines available	96	
	Medicines are expensive	50	
	Medicines are not working to treat disease	41	
	No animal health provider nearby	64	

When their animal are sick, 33.5% go to government animal health clinics, 30.7% go to private vet clinics, 17.1% go to any shop and buy medicines and 18.7% use traditional medicines.

According to the respondents, the most common challenges that they face in treating their animals are 38.2% no medicines available, 25.5% no animal health provider nearby, 19.9% medicines are expensive and 16.3% medicines are not working to treat disease. The details of animal owners' practices described in Table 5.

DISCUSSION

Inappropriate antibiotic use in animal production has serious consequences for public health and the environment. MDR organisms have been isolated from livestock, posing serious public health threats, particularly in low- and middle-income countries such as Ethiopia. These MDR bacteria are frequently transmitted to humans via the food chain, the environment, bodies of water and close contact with these animals [8].

Data on the knowledge, attitudes and practices (KAP) of stakeholders can help in the planning, implementation and evaluation of disease control programs. Furthermore, these are useful to identify knowledge gaps. The KAP questionnaires administered in the current study provided a valuable insight into the awareness and approaches of farmers towards the knowledge, attitude and practice towards AMR and AMU in the study area.

Many factors play a role in the increasing development of antibiotic resistance, thus threatening Public-health by becoming a national and global problem. Prophylactic and therapeutic antibiotics commonly used in animals draw attention as one of the most important factors. Knowledge, attitudes and behaviors of livestock farmers regarding the use of antibiotics in animals play a significant role in the development of antibiotic resistance. However, previous reports indicated that a significant portion of the farming community do not have sufficient information about antibiotic knowledge, antibiotic use and resistance [9].

In the present study, 60.9% of the animal owners are not knowledgeable about AMU and AMR. This finding is in line with the finding of *Nuangme et al.* [10] in layers and pig farmers in Thailand which is 61.2% of farmers have not knowledge about AMR and AMU and it is lower than the finding of Ozturk *et al*. [11] which is 90% of the animal producers in Bingol, Turkey, 92.5% of livestock and aquaculture owners in Vietnam by Pham-Duc *et al.* [12] and Gemeda *et al*. [13], which is 70% of the livestock keepers in Ethiopia is not knowledgeable about the AMU and AMR and higher than the finding of Takele *et al*. [14] 35.5% of animal producers in central Ethiopia. This difference could be a result of different AMU and AMR awareness levels of the livestock producers in different localities.

Also, 32.7% of the animal producers had a trend of using prescriptions before purchasing antimicrobials which is contrast to the study of Guido *et al*. [15] 48% of turkey and rabbit farmers in Italy, Ozturk *et al.* [11], 42% of the animal producers in turkey were seeking the advice of a veterinarian before using antimicrobials for any purpose of animal production. Accessing antimicrobials without a prescription and fragmented governance of AMU in animal production are the main drivers of AMR formation.

Of the animal producers (34.7%) has used antimicrobials for treatment purposes this is lower than the study of Pham *et al*. [12] Which is 69% of the livestock farmers in Vietnam, 38% of the livestock farmers in African countries by Caudell *et al.* [9] and higher than 28.6% of farmers in Swiss Guido *et al*. [16] confirmed that they mainly use antimicrobials for treatment purpose.

In our finding, 17.5% of animal producers have purchased antimicrobials from veterinary pharmacies while 12% and 15.9% get antimicrobials from open markets and traditional practitioners respectively. Alike this finding, the source of antimicrobials for the majority (89%) of livestock producers in Vietnam Pham- *et al*. [12] and 83% of livestock farmers in different African countries Caudell *et al*. [17] get antibiotics from Agro-vet pharmacies.

Although the extent of antibiotic use in animals in developing countries is unknown, one study from Kenya reported that oxytetracyclines, sulfonamides and aminoglycosides were the most commonly used antimicrobials for veterinary purposes. Frequent use of the same antibiotics for long time has been shown elsewhere to cause selective pressure to bacteria resistant to those specific antibiotics [5].

In the current study, majority of animal owners/workers (66.1%) used antibiotics in the previous month and of these (49.8%) self-selected without a prescription. Farmers in many countries can easily obtain antibiotics without a prescription to reduce the cost of veterinary services and use their prior experience to use the antibiotics, which supports our findings [18].

This study has shown that Albendazole oxytetracyclines, pen-strip, penciline and sulfa drugs were the most commonly used antimicrobials without a prescription in the study area. This is similar to the findings of Adebowale [19] and Ogunleye *et al*. [20] who found that oxytetracycline, quinolones and sulfonamides were the most commonly used antibiotics in poultry in Ogun state.

CONCLUSIONS AND RECOMMENDATIONS

Antimicrobial resistance is a multifactorial problem which requires input from various stakeholders. Existence of strong Global and National Action Plans for AMR should be boosted with development of communication strategies. Unlike the other disease conditions experienced in the health sector, AMR is a unique phenomenon that requires novel mitigation strategies. As a result, it is inevitable to put in place communication strategies that will lead to behavior prediction and effective behavior change strategies among all actors in AMR. This is likely to be a gradual process that will demand immense and consistent input from all players to battle AMR.

The current study shows that the misuse of antibiotics in livestock in the study area is high; this may, in part, simply be due to a lack of knowledge. Many of the livestock keepers were not aware of the concept of antimicrobial resistance and did not know that the use of antibiotics can have effects on the health of their animals and their health. Based on the above conclusions the following recommendations are forwarded:-

- The Ethiopian veterinary drug and feed administration and control Authority should enforce restrictions on delivering, Purchasing and using antibiotics without a prescription to reduce antimicrobial use and resistance.
- The Amhara regional state should take Necessary measures to limit and control the use of veterinary drugs
- The Farta woreda veterinarians and Health professionals should be given periodic education to raise community knowledge on AMR and AMU by giving special emphasis on malpractices and attitudes to provide accurate information to the targeted people who have lower educational level.
- The Federal Ministry of Health and Ministry of Agriculture should work in cooperation with information sources like radio, television programs and newspapers to forward information related to AMR and AMU for enhancing the level of knowledge of the community about the deadly nature of AMR and the availability of preventive measures.
- Improved surveillance and national regulation is needed in both human medicine and food animal production to ensure those antimicrobials are used prudently

Limitation of the Study: The major limitation of this study was the relatively small number of participants which might not reflect the real situation of KAP of animal farm owners/workers this is due to several factors such as unwillingness to participate or lack of interest, long questionnaire, Sometimes respondents have declined to share information and shortening of the work time.

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