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Original Research

Assessment of Community Knowledge, Attitude, and Practice Towards Antimicrobial Use and Antimicrobial Resistance In Dangila District, Amhara, Ethiopia

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Abstract

Antibiotic resistance is a multidisciplinary universal public health issue that affects the health of people, animals, and the environment. This study aimed to assess the attitudes, habits, and understanding of livestock owners on applying antibiotics and antibiotic resistance. The study used a cross-sectional design between May and August 2023 in the Amhara regional state of the Dangila district, Ethiopia. For the study, 384 participants in the total study population addressed questionnaires. An analysis of the participants' demographics showed that most were male, and their age range was between 30 and 50. According to the Antimicrobial Use (AMU) and Antimicrobial Resistance (AMR) knowledge evaluations, 17.4% of respondents claimed to be aware of vaccines, while 82.6% were unaware. When asked how frequently an animal was treated, the majority of respondents, 54.4%, answered that each animal received therapy four times a year, and 95.1% claimed that medications were ineffective for treating animals. The results of the current investigation clearly show that knowledge regarding the use and resistance of antibiotics is lacking. To reduce antimicrobial resistance in the study area, focusing on AMU and AMR practices and attitudes is also recommended.

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INTRODUCTION

Antimicrobial resistance (AMR) is a global public health concern that affects humans, animals, and the environment (Gajic et al., 2022). Nearly a quarter of all antimicrobials are used in the global food-producing animal business (Hassan et al., 2021). Antimicrobial agents are used in the livestock industry for several purposes, including prophylaxis, -growth enhancement, and therapeutic applications. AMR in pathogens can emerge and spread because of incorrect antibiotic use in commercial animal agriculture (Economou & Gousia, 2015). International research has demonstrated a strong positive link between the emergence of resistance and the improper use of antibiotics (Hockenhull et al., 2017).

One of the biggest and most urgent issues facing public health is antibiotic resistance, which adversely affects ecosystems and healthcare (Chowdhury et al., 2015; Monyiloh et al., 2018).

AMR's immediate effects of AMR on the livestock sector include reduced output, high treatment costs, and decreased food quality. The rise in AMR has the potential to pose a threat to the effectiveness of therapy, raising treatment failures and resulting in extended and more severe sickness durations with higher expenses and deaths (Al Amin et al., 2020).

Antimicrobial resistance develops once "living things (such as pathogens, fungi, and parasites) mutate after they come in contact with antimicrobial substances" (Bennani et al., 2020). Although various causes aggravate AMR, the overuse and abuse of antimicrobial drugs have a significant influence. Indeed, AMR production and spread are selection processes that permit the growth of bacteria in their surroundings. Thus, AMR is inherently associated with all types of antimicrobial use and is favored in situations where such use is either insufficient or pervasive.

AMR is mostly thought to be caused by factors that can be avoided, such as using antimicrobials (AMU) for growth promotion, preventative care, and metaphylaxis in animal production, lack of professional advice, and use of bad testing methods (Morar et al., 2015). Food, water, and environmental factors can cause antibiotic-resistant diseases in humans and animals. Infections caused by antimicrobial-resistant pathogens are extremely difficult to cure (Wesangula et al., 2020).

Inadequate inspection, unskilled irregular pharmaceutical groups, and a lack of test-diagnostic services all contribute to the difficulty in managing antibiotic stocks in veterinary medicine. Veterinarians' passionate engagement in the AMU was a critical step toward minimizing AMR. Further research on knowledge gaps, unfavorable attitudes, and antibiotic prescription habits among practicing veterinarians is required. There is a scarcity of data on the community's understanding, beliefs, and behavior regarding antimicrobial usage and resistance, which is critical for better understanding people's levels of knowledge and implementing successful awareness-raising campaigns. This study aimed to assess community knowledge, attitudes, and practices regarding antibiotic use and resistance in the study area.

MATERIALS AND METHODS

Study Area Description

This study aimed to investigate the community's understanding, opinions, and behavior assessment of antibiotic usage and resistance in the Dangila district, which is 78 km from Bahir Dar, the capital of the region, and 470 kilometers from Addis Ababa. Northwestern Ethiopia is home to Dangila. This city is situated in the Agew Awi Zone of the Amhara Region at 11°16′N, 36°50′E, and has an altitude of 2137 m above sea level. Dangila had a total population of 53,225 according to the Central Statistical Agency of Ethiopia's (2021) national census, with 27,412 males and 25,813 females.

Target Population

The study population consisted of Dangila district livestock owners, with age, gender, and educational status as the demographic variables.

Study Design

A cross-sectional study was conducted between May and August 2023. To gather information for the qualitative study analysis, 384 individuals participated in a structured questionnaire.

Sample Size Determination

The sample size was determined using the specified methodology, with a predicted prevalence of 50% and absolute required precision of 5% at a 95% confidence level. As no prior studies have been conducted at the research locations, Thrusfield (2018) gathered 384 samples.

$$n = 1.96^2 \times \frac{Pex\ p\ (1- Pex\ p)}{d^2} = 384$$

where n is the required sample size, P is the calculated prevalence, and d is the desired absolute precision.

Sampling Method

A combination of convenient sampling and a simple random sampling approach was used. As a result, six Kebeles were selected from the district's 36 Kebeles using convenient sampling, and respondents and livestock owners were chosen through a simple random sample approach for an individual questionnaire survey from six Kebeles.

Data analysis

The raw data collected during the interviews were entered into a Microsoft Excel spreadsheet and coded for analysis. Descriptive statistics were computed using SPSS version 20.0 The findings are presented in the tables.

RESULTS AND DISCUSSIONS

Results

Demographic traits of participants

This study included 384 participants from the study population. According to demographic data, 74.5% of the respondents were male and 25.5% were female. In terms of ages 30 to 50, 73.2%; greater than 50, 19.5%, and 21 to 29 years, 7.3%. Regarding educational status, 42.7% of participants could not read or write. Items related to AMU and AMR were positively correlated ($p<0.05$) with respondents' general demographics (Table 1).

Table 1

Demographic features of responders regarding antimicrobial use and resistance

Variable	Categories	N=384	%
Gender	Male	286	74.5
	Female	98	25.5
Age	21-29	28	7.3
	30-50	281	73.2
	>50	75	19.5
Level of education	Unable to read or write	164	42.7
	Read and write	130	33.9
	Elementary 1-8	42	10.9
	High school grades 9-12	17	4.4

Table 1 continues.	Diploma	10	2.6
	Higher educated	21	5.5
Total no. of livestock care	From 1-50	228	59.4
	From 51-100	129	33.6
	>100	27	7.0

Knowledge of the participants regarding AMU and AMR

According to the AMU and AMR knowledge assessments, 7.4% of the respondents knew about antimicrobial use, while 82.6% did not. All variables analyzed for AMU and AMR were significantly associated ($p<0.05$) with the respondents' knowledge, except for the question about using vaccines to treat sick animals, which was not statistically associated ($p>0.05$) (Table 2).

Table 2

Participants' knowledge of antimicrobial use and resistance

Knowledge related items	Response		%	%	P-Value
	Yes	No	Yes	No	
1. Do you know what vaccination is used by animals?	67	317	17.4	82.6	0.000
2. What vaccinations do?					
(A) Avoid illness in animals	41	343	10.7	89.3	
(B) Treat illness in animals	1	383	0.3	99.7	0
(C) Both above	25	359	6.5	93.5	0.318
3. For which diseases and animal species are vaccines available?					
(A) Newcastle disease (Poultry)	67	317	17.4	82.6	
(B) Anthrax (Cattle, Sheep, Equine)	43	341	11.2	88.8	
(C) AHS (Equine)	41	343	10.7	89.3	0.000
(D) Lumpy skin disease/(LSD)(Cattle)	43	341	11.2	88.8	
(E) Sheep and Goat pox (SHOAT)	43	341	11.2	88.8	
4a. What Diseases/symptoms are often encountered?					
(A) Pneumonia	130	254	33.9	66.1	0.000
(B) Bloody diarrhea or Dysentery	87	297	22.7	77.3	0.000
(C) Tubercullosis	10	374	2.6	97.4	0.001
(D) Trypanosomosis	294	90	76.6	23.4	0.000
(E) Fever	8	376	2.1	97.9	0.005
(F) Newcastle disease	357	27	93	7	0.000
(G) Foot and mouth disease (FMD)	154	230	40.1	59.9	0.000
(H) Lumpy skin disease	283	101	73.7	26.3	0.000

Table 2 continues.,

4b. What Antimicrobials do you know?					
(A) Penicillin	373	11	97.1	2.9	0.000
(B) Streptomycin	0	384	0	100	-
(C) Pen-strep	344	40	89.6	10.4	0.000
(D) Oxytetracycline	378	6	98.4	1.6	0.000
(E) Ivermectin	378	6	98.4	1.6	0.000
(F) Sulfamethoxazole	7	377	1.8	98.2	0.008
5. Do you know what antimicrobials mean?	67	317	17.4	82.6	0.000
6. What antimicrobials do?					
(A) treat ill livestock	8	376	2.1	97.9	0.005
(B) Keep livestock from getting ill	5	379	1.3	98.7	0.025
(C) Both A and B	371	13	96.6	3.4	0.000
7. Have you heard /know about antimicrobial resistance?	67	317	17.4	82.6	0.000
8. Would you explain antimicrobial resistance?	67	317	17.4	82.6	0.000

%=Percent

Attitudes of Participants Regarding AMU and AMR

Based on the frequency of therapy, 54.4% of respondents said that each animal was treated four times per year. Respondents' attitudes toward AMU and AMR were examined, and 95.1% of the respondents stated that they did not work to treat diseases. The respondents had favorable opinions about the need for novel treatments (vaccines), effective diagnosis and hygiene, proper animal nutrition, and proper waste disposal. Furthermore, all the respondents were unaware of this because they had to wait for drugs to be eliminated from the bodies of animals before using their products for human use. All variables analyzed for AMU and AMR were significantly linked ($p<0.05$) to their respective attitudes (Table 3).

Table 3

The attitude of respondents about antimicrobial usage and resistance

Attitude related items	Response		%		P-value
	Yes	No	Yes	No	
1. On average, how often did you encounter illnesses in any of your animals per month/Year?					
(A) 2 months	26	358	6.8	93.2	0.000
(B) 2 years	27	357	7	93	
(C) 3years	122	262	31.8	68.2	
(D) 4 years	209	175	54.4	45.6	

Table 3 continues.,

2. What challenges do you face in treating your animals?					0.000
(A) No animal health provider nearby	282	102	73.4	26.6	
(B) Scarcity of medicines available	332	52	86.5	13.5	
(C) Medicines are expensive	207	177	53.9	46.1	
(D) Medicines are not working to treat disease	365	19	95.1	4.9	
3. Who advised you or provided information to administer antimicrobials?					
(A) Animal health worker	384	0	100	0	-
(B) Veterinary drug holder	360	24	93.8	6.2	0.000
(C) Pharmacy professional	19	365	4.9	95.1	0.000
(D) The feed distributor company	8	376	2.1	97.9	0.005
(E) Traditional medicine practitioner	10	374	2.6	97.4	0.001
(F) Other farmer	16	368	4.2	95.8	0.000
(G) Own experiences	12	372	3.1	96.9	0.000
4. What causes antibiotics are not work?					
(A)Antimicrobial resistance	67	317	17.4	82.6	0.000
(B) Poor adherence to treatment (discontinue giving or not following correct administration and full course)	136	248	35	64.6	
(C) Use of poor quality or Counterfeit medicines	345	39	89.8	10.2	
(D) Using the wrong antimicrobials	337	47	87.8	12.2	
(E) Overcrowding, Poor hygiene and sanitation	244	140	63.5	36.5	
(F) Poor feeding practices	211	173	54.9	45.1	
(H) Owners self-prescription of medicines for their animals	366	18	95.3	4.7	
5. What do you think are the solutions for antimicrobials not working?					0.001
(A) Do not know	11	373	2.9	97.1	0
(B) Hygiene, proper feeding of animals	274	110	71.4	28.6	
(C) Proper diagnosis and treatment with AMs	325	59	84.6	15.4	
(D) Use of quality or legal sources or non-countering or non-contraband AMs use	26	358	6.8	93.2	
(E) Proper waste disposal	168	216	43.8	56.2	-
(F) Wait until the medicines are cleared from the body of feed animals before their products used	0	384	0	100	0.000
(G) Develop new medicines/vaccines	357	27	93	7	

%=Percent

Practices of Respondents Regarding AMU and AMR

According to AMU and AMR assessments, when livestock becomes sick, most owners bring them to government animal health clinics. A large number of respondents, 93.5%, replied that they used antimicrobials for animals at least once per month. A vast majority of the respondents, 96.6%, stated that the reasons for using antimicrobials were to treat animals with diseases and prevent them from becoming diseased. A large proportion of respondents, 86.5%, reported using antimicrobials two to five times each month. The primary suppliers of antimicrobials were veterinary clinics (100 %) and pharmacies (52.9 %). About 95.3% of the respondents responded that they self-prescribed antimicrobials for sick animals. However, the majority of respondents 97.9% completed the full dose and duration of antimicrobials prescribed. However, 100% of the respondents stopped administering antimicrobials before they were supposed to because they believed that the animal had improved or been cured. There was a significant association ($p<0.05$) between all the factors analyzed for AMU and AMR and their related practices (Table 4).

Table 4

The practice of respondents about antimicrobial usage and resistance

Practice related items	Response		%		P-Value
	Yes	No	Yes	No	
1. What did you do when encountering such illness in animals?					
(A) Do nothing	0	384	0	100	-
(B) Go to the government animal health clinic	384	0	100	0	-
(C) Go to private vet clinic	53	331	13.8	86.2	0.000
(D) Go to a nearby veterinary pharmacy and buy medicines	184	200	47.9	52.1	0
(E) Use traditional medicines in your area	18	376	2.1	97.9	0
2. Have you had any recurrences or difficulties in treating animals?	345	39	89.8	10.2	0
3. Have you ever used antimicrobials for your animals in the last month?	359	25	93.5	6.5	0
4. Why do you use antimicrobials? Because I wanted to					
(A) Treat sick animal	8	376	2.1	97.9	0.005
(B) Prevent from being sick	5	379	1.3	98.7	0.025
(C) Both A and B	371	13	96.6	3.4	0
5. Were the medicines used were?					
(A) Prescribed by healthcare provider	366	18	95.3	4.7	0
(B) Self-selected	366	18	95.3	4.7	0

Table 4 continues.,

(C) Recommended or given by neighbors	126	258	32.8	67.2	0
6. How frequently do you use antimicrobials over 1 month period?					
(A) Once	52	332	13.5	86.5	0
(B) 2-5 times	332	52	86.5	13.5	0
(C) More than 5 times	0	384	0	100	0
7. What are the sources of antimicrobials you used?					
(A) Open market	0	384	0	100	-
(B) Any shop	0	384	0	100	-
(C) Vet pharmacy	203	181	52.9	47.1	0.000
(D) Human pharmacies	13	371	3.4	96.6	0.000
(E) Vet clinics	384	0	100	0	-
(F) Traditional practitioner	10	374	2.6	97.4	0.001
(G) Community animal health worker	31	353	8.1	91.9	0.000
(H) Private veterinarian	142	242	37	63	0.000
(I) Government animal healthcare provider	130	254	33.9	66.1	0.000
8. Have you ever self-prescribed antimicrobials for sick animals in your home or neighbors?	366	18	95.3	4.7	0
9. Do you give the full dose and duration of the antimicrobials as chosen?	376	8	97.9	2.1	0.000
10. Why fail to give the entire dosage of the antimicrobials as advised?					
(A) Have insufficient funds	8	376	2.1	97.9	0.005
(B) Believed that enough	8	376	2.1	97.9	0.005
(C) Advised from others	8	376	2.1	97.9	0.005
11. Do you ever stop giving antimicrobials before you were supposed to?	384	0	100	0	-
12. Why did you stop giving antimicrobials?					
(A) To save for later use	137	247	35.7	65	0.000
(B) Because the antimicrobials do not work	55	329	14.3	85.7	0.000
(C) Believed that the animal has improved or cured	384	0	100	0	-
13. Have you heard of antimicrobials for later use other than the current use?	341	43	88.8	11.2	0.000
14. If the antimicrobials in your hands or those for some reason are expired, what do you do with them?					
(A) Will use them when needed	0	384	0	100	-
(B) Will not use them	384	0	100	0	-

Table 4 continues.,

(C) Throw away	384	0	100	0	-
(D)Return to where you bought	380	4	99	1	0.000
15. Do you know that antimicrobials that are used to work in treating infections in animals may not work if not used properly?	384	0	100	0	-

%= Percent

Discussions

This study was conducted to assess community knowledge, attitudes, and practices regarding AMU and AMR usage and resistance in the Dangila District, Amhara, Ethiopia. Additionally, as part of an effective confrontation against AMR, our study is expected to offer sufficient assessment and possible insights into building tri-faceted interventions to promote appropriate antibiotic use, cover knowledge gaps, and correct attitudes. A total of 384 participants were included in the study.

Various age groups and sexes were represented in the study to provide a fair and reliable result. Our findings indicate that awareness of when and how to use antimicrobials and the risk of antimicrobial resistance is fairly adequate and acceptable. The risks related to AMR are expected to decrease with farmers' knowledge and attitudes regarding vaccines, antibiotics, drug withdrawal, and AMR. Vaccines are a preventative measure to prevent the spread of infections. Antibiotic use may increase the incidence and spread of AMR (Bharti et al., 2020; Micoli et al., 2021).

In the current study, 17.4% of animal owners understood the value of vaccination for animals, while the remaining 82.6% had no thought about what vaccination did, indicating a knowledge gap among livestock owners in the study area. In the current survey, a small proportion of respondents reported that they were aware of antibiotic resistance, which causes treatment failure and poor response to medication (17.4 %). However, many respondents (82.6 %) were unaware of antibiotic resistance, which leads to treatment failure and poor outcomes. These findings correspond with those of a previous study that indicated that nearly all farmers are unfamiliar with why and when they take immunizations. In the current analysis, farmers' knowledge levels were low, as mentioned by Tenzin et al. (2023). Most livestock farmers (94 %) were unaware of the presence of AMU, AMR, and antibiotic residues. This was significantly lower than prior findings of 70% and 80%, indicating farmers' weak comprehension of AMU and AMR in Ethiopia (Gemeda et al., 2020; Geta & Kibret, 2021).

Many participants in the current analysis claimed they knew and used oxytetracycline and ivermectin (98.4 %), penicillin (97.1 %), and pen-strep (89.6 %), while the fewest indicated they knew and used sulfa medicines (1.8 %). However, all the respondents were unaware of the use of streptomycin. This result was greater than that of prior research, which found that the five most commonly used antibiotics in the study region were oxytetracycline (28 %), penicillin (28 %), pen-strep (penicillin and streptomycin fixed combination) 18%, and sulfa medicines 0.06%. Concerning animal diseases, Newcastle disease

93.0%, trypanosomiasis 76.6%, LSD 73.7%, FMD 40.1%, pneumonia 33.9%, bloody diarrhea 22.7%, tuberculosis 2.6%, and fever 2.1% were among the most common diseases seen in the area (**Table 2**). This finding was relatively greater than the study of FMD 6%, diarrhea 64%, bovine tuberculosis 37%, and trypanosomiasis 5% and was more common than lumpy skin disease 43%, Tufa et al. (2023).

The primary rationale for AMU, as reported by animal owners in the current study area, was to cure animal disease (2.1%), prevent infections from causing diseased animals (1.3%), and treat diseased animals and prevent disease (96.6%), with only 3.4% of them not using antimicrobials. This result deviates from a prior study (Alnasser et al., 2021; Caudell et al., 2020), which found that over 50% of livestock breeders did not use antibiotics (57%), with 21% of farms using AMU for treating sick animals, 14% for infection prevention, and 9% for both disease management and prevention.

In the present study, the primary sources of antimicrobials were veterinary clinics (100 %) and veterinary pharmacies (47.1 %), with some respondents coming from private veterinarians (37 %), government animal healthcare providers (33.9 %), community animal health workers (8.1 %), human pharmacies (3.4 %), and traditional practitioners (2.6 %) (Table 4). Additionally, none of the respondents used shop- or open-market-sourced antimicrobials. These findings are higher than those reported in previous studies (Gebeyehu et al., 2021), which were sourced from local dispensers (19.8 %), veterinary clinics (34.9 %), and veterinary pharmacies (45.4 %).

The current study revealed that livestock owners have positive attitudes toward developing new medicines or vaccines (93%), proper diagnosis and treatment of AMR (84.6%), hygiene and proper feeding of animals (71.4%), and some respondents' waste disposal (43.8%). Of the respondents, 2.9% were unsure and 6.8% were possible remedies for treatment-related antimicrobial failure (Table 3). These results are consistent with those of earlier research (Hossain et al., 2022), which found that 39% of participants used non-functional antibiotics as a treatment, 38% developed a new medication or vaccine, 31% followed recommended drug withdrawal periods, 31% disposed of waste properly, 29% fed them properly, and 31% practiced good farming hygiene.

CONCLUSIONS

The dynamic interest of veterinarians within the AMU is imperative for reducing the occurrence of AMR. Furthermore, little information is available on the practices, unfavorable attitudes, and understanding gaps associated with the prescription of antibiotics by active veterinarians. Multi-sectoral and integrated awareness-raising for animal producers is crucial for reducing the contribution of animal production to the global health risk of AMR. This should be conducted in a range of nations with differing degrees of economic development in their livestock sectors. The prevalence of illegal antimicrobial exchanges and the distribution of subpar medications led to the selection of the study location.

Recommendations

Based on the conclusions, the following recommendations are proposed:

(i) This suggests an improvement in livestock owners' understanding of AMU and AMR.
(ii) Promote mindsets and behaviors to prevent antimicrobial resistance in the community.
(iii) Further research should be conducted to determine their impact on the study area.

CRediT authorship contribution statement

Molla Mossie: Conceptualization, Methodology, Writing - Original Draft **Bayisa Kenaw:** Formal analysis, Investigation, **Haimanot Getnet:** Data Curation, Visualization **Dawit Dejenie:** Validation, Writing - Review & Editing, **Tigist Shallo:** Resources, Supervision.

Declaration of Competing Interest

The authors declare that there is no conflict of interest.

Data availability

Data will be made available on request.

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