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Original Research

Assessment of Knowledge, Attitude and Practices Towards Antimicrobial Usage and Resistance among Healthcare Professionals in Ambo and Gudar Towns, West Showa, Oromia, Ethiopia

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Abstract

Antimicrobials Resistance (AMR) is one of the top global public and economic threats. The goal of the current study was to assess the knowledge, attitudes, and practices towards antimicrobial usage and resistance among veterinary and human healthcare professionals in the Ambo and Gudar towns. A cross-sectional study was conducted on 120 randomly selected participants. A semi structured questionnaire consisting of 49 questions were employed. The data was analyzed using Statistical Software Package (STATA, version 17). Descriptive statistics and chi-square test were employed for describing the data and make inferential. The majority (56.67%) of healthcare professionals agreed that antimicrobials are effective against viral infections. About 38.33% of the participants agreed that the use of antimicrobials in animals intended for food-can result in resistant bacteria being transmitted to humans. Nearly half (48.33%) of respondents agreed that inappropriate antimicrobial use can lead to drug resistance. About (42.50%) healthcare professionals agreed that the link between the health of humans and animals and their environment is important in preventing antimicrobial resistance. Respondents' attitude was significantly influenced by sociodemographic characteristics, including sex (x^2= 6.70, P=0.01) and age ($x^{2=}$13.74, P=0.03). About 41.67% of health care professionals were always responding to the use of national medical antimicrobial prescription guidelines. The study identified lack of knowledge, and malpractice albeit positive attitude towards AMU and resistance. This warrant continuing capacity building programs for the professionals on AM usage and resistance, and development field-friendly disease diagnosis and management tools are essentially in need to reduce AMR.

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INTRODUCTION

Antimicrobial agents are used in the farming of animals for different purposes including restorative, metaphylaxis, prophylaxis and as growth promoters (Economou *et al*., 2015). Antimicrobial resistance (AMR) is a worldwide scenario that has been developed and exacerbated by inappropriate usage of antimicrobials. Recently, AMR has become a global public issue that has increased mortality and morbidity rates, cross-transmission within and between health care settings, and increased consumption of limited resources. The overall increase in bacterial resistance undermines the effectiveness of antibiotics in the treatment of illnesses (Hulscher *et al*., 2010). Currently, a significant number of drugs are used in human and veterinary medicine around the globe under virtue of developing resistance. Similarly, many scientists are diligently working to develop new drugs that have a wider antimicrobial spectrum, more stable activity, and better health profiles (Zygmuntowicz *et al*., 2020).

Having about 70 million head of cattle, 40 million sheep, 51 million goats and 49 million poultry in 2021, Ethiopia had abundant livestock in Africa (central statistics agency, [CSA], 2021), indicative of abundant usage of AMs for heath maximization. For fit the demand for animal origin food as the country population growth at increasing rate, the livestock sector has started to dramatically increase livestock production (Food and Agriculture Organization [FAO], 2019), this in turn increases the

utilization of antimicrobials (Boeckel *et al.,* 2015). Due to the demand increment for animal origin protein, antimicrobial usage (AMU) as food for animal growth promotion is doubled the use of AMs in near future (World Food Organization [WFO], 2020).

Antimicrobial resistance has sparked an ever-growing and rising interest in new antimicrobial technologies (Doron and Davidson, 2011). Extreme antibiotic use and a lack of disease management techniques that support the propagation of safe infections are among the two major contributing factors to AMR (Hardy, 2013; Okeke, 2010; Cupić *et al*., 2021). Financial factors, lack of understanding, and the unregulated sale and usage of antibiotics as over-the-counter medications in the majority of low income and middle-income countries all contribute to the abuse and mistreatment of antibiotics. It is simply assumed that the problem will be worse in non-industrialized countries where intractable disease is common, there is poor access to clinical care, and guidelines are unfavorable. Additionally, there are no adequate organizations that focus on information, viewpoints, and research related to antibiotics, and those that tend to spread inaccurate information and mindsets (Miller *et al*., 2020).

Antimicrobial resistance is a major concern for most African countries, the so called low and middle incomes, which are associated with poverty, a high prevalence of infectious diseases, and uncontrolled antimicrobial use in animals and humans (Ayele *et al*., 2022). There is little information regarding AMU and AMR in Ethiopia. A few studies conducted in the country revealed the presence of antimicrobial residues in animal origin food, and poor AMU practice among food animal rearing communities (Gemeda *et al*., 2020; Gebeyehu *et al*., 2021). According to all accounts, this scenario is even worse in Ambo and Gudar, where drug sales, circulation, and supply are reliant on lax or nonexistent laws. In addition, the national agency for food and medication administration and control is in charge of overseeing, regulating, and monitoring the food and pharmaceutical sector (Akinyandenu *et al.,* 2014).

Antibiotic use education and general well-being mindfulness are essential for halting the emergence of antimicrobial opposition/resistance as they foster understanding and alter social perceptions. Two of the five estimates identified by the World Health Organization's overall activity plan for combating antimicrobial opposition are the expansion of public awareness and cognizance through compelling public communication and the advancement of antibiotic use in veterinary/human medicine (World Health organization [WHO], 2015, Tesfaye, 2017). Assessment regarding AMU in food animals is of paramount importance in for understanding and preventing the potential risk posed by AMR to animal, public health and economy of a country (Landers *et al*., 2012, Cerniglia *et al.*, 2016). It is revealed that detailed understanding of AMU can pave way for tackling AMR and taking effective action against it (Ungemach *et al*., 2006). Understanding the KAP concerning the usage of AM across distinct groups within a population in Ethiopia where livestock and livestock products are mostly used is crucial. The KAPs of AMU and AMR in both veterinary and human populations particularly in the Ambo and Gudar area were not studied as per knowledge of the authors. Therefore, the study was aimed to assess the knowledge, attitudes, and practices about antimicrobial usage and resistance among veterinary and human healthcare professionals in the cities of Ambo and Gudar.

MATERIALS AND METHODS

Description of the Study Areas

The study was carried out in Oromiya region, specifically in the Ambo and Gudar towns (**Figure 1**) of West Shewa zone. Ambo town is the capital city of the West Shoa zone of the Oromia regional state which was found 144 km to the west of Finfinnee within latitudes of 8°59′and 8.983°N and longitudes of 37°51’ and 37.85°E and has an elevation of 2101 meters above sea level. The town has a total population of 96,521 of which 4869 are children of under-five years old. There are 02 public hospitals, 02 health centers, 32 private clinics, and 10 pharmacies (Feyisa *et al*., 2020). The Ambo district has a livestock population of 145371 cattle, 50152 sheep, 27026 goats, 105794 chickens, 9088 horses, 2914 donkeys, and 256 mules (CSA, 2021). There are 13 veterinary clinics in the study district and a total of 21 veterinary professionals, of which 8 are DVM holders, 11 are BVSc holders and 14 are animal health attendants (Ambo District Agriculture Office, unpublished data, 2019).

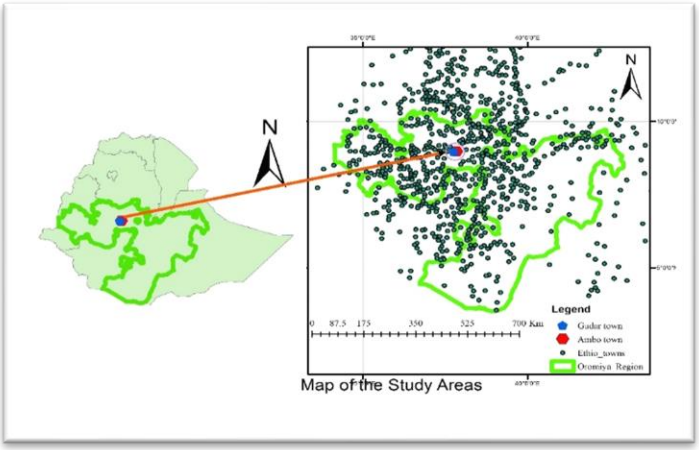

Figure 1: Map of the Study Areas

Gudar is a town located within the Oromiya regional state that is situated approximately 19 kilometers (km) west of Ambo and 144 kilometers (km) West of Finfinnee (the capital city of Ethiopia). The area is located in central Oromia, Ethiopia, between 8°56'30" and 8°59'30" N latitude and 37°47'30" and 37°55'15" E longitude. It is situated between 1600-3194 meters above sea level. It experiences 800-1000 mm of yearly rainfall,

with June through September seeing the heaviest amounts (Duguma, 2021; Gudar District Agriculture Office, unpublished data, 2019)

Study Population

Health care professionals (HCPs) from both veterinarians and human health professionals working in Ambo and Gudar towns were randomly chosen as the study population.. The years of experience were categorized as 1-5, 6-10, 11-15, or greater than 15 (Steward *et al*., 2019).

Inclusion and Exclusion Criteria

Individuals with an age of equivalent to 18 years and experience above zero years were included whereas with less than 18 years old and unwilling were exempted.

Study Design

A cross sectional study was used to accomplish the current research from October 2021 to April 2022.

Sampling Method and Sample Size Determination

The numbers of participants included in the present study was determined based on the sample size calculation recommended by Arsham (2007), which is $N = 0.25/SE2$, where SE stands for standard error, as well as Whitley and Ball's (2002) formula (which is N"= N/1-q, where N" is the final sample size to be collected, N= the first sample size calculated by Arsham (2007) and q= proportion of attrition), which was used to increase the accuracy of the result and to compensate respondents who were expected to refuse to participate or to drop out before the study ends. Hence, by considering a standard error of 5%, a precision level of 5%, a confidence level of 95% and a proportion of attrition of 17%, a total of 120 samples were collected.

Reliability and Validity of the Data

For the reliability and validity of the Data used in this study the questionnaire developed by the research team was received by other researchers, and research team of Wallaga University School of Veterinary Medicine. The questionnaire was also pre-tested by attempting pilot study and some refinement and correction were made.

Data Collection and Measurement Tools

The data were collected means of a self-directed questionnaire on 120 randomly selected veterinary and human medical care professionals residing in Ambo and Gudar towns to determine the KAP of AMU and AMR in both professions. A semi structured questionnaire was used as data collection tool. The questionnaire comprised of two sections; closed and open ended, with the majority of the questions being closed-ended. The questionnaire comprised of 14 knowledge related questions, 17 questions about attitudes, and 12 questions concerning practices. The questions were on five Likert scale. A five point Likert scale ranging from 1 to 5 was to score knowledge and attitude questions. A score of one was for the least appropriate whereas 5 for the most appropriate response. The minimum and maximum possible scores for the knowledge sections were 14 and 70 respectively. The lowest possible score was 17, and the highest possible score was 85 for the attitude section. Then, after calculating the mean for all respondents, the scores were transformed to a scale ranging from 0 (worst possible score) to 100 (best possible score) with the following formula (WHO, 2022; Higuita *et al*., 2020).

$$\text{Total score } (\%) = \frac{\text{Obtained score} - \text{least possible score}}{\text{maximum score} - \text{least possible score}} \times 100\%$$

Total scores of <50%, 50-70%, and ≥70% were categorized as low, moderate, and high knowledge scores, respectively (Shehadeh *et al.,* 2012). Attitude score analysis was categorized into two categories (negative and positive), in which an attitude score <50% was regarded as negative and a ≥50% proportion was regarded as a positive attitude score.

Data Management and Analysis

The data collected from the respondents were entered into Microsoft Excel spreadsheet version 2016 and checked for errors. Then, the data were imported and analyzed by STATA version 15.1 (STATACORP LLC. College station, Texas 77845 USA). Descriptive statistics such as proportion and frequency were utilized to present the results of demographic features of the respondents, knowledge, attitudes and practice questions. Scoring the knowledge and attitude was performed using an Excel spreadsheet. Chi-square test was employed to analyze the association between the KAP score the demographic profiles of the respondents. The statistical significance level was set at a 95% confidence level and a 5% level of precision so that a p value ≤ 0.05 was considered as statistically significant.

RESULTS

Sociodemographic Profiles of the Respondents

Over half (53.33%) of the 120 study participants were males, while 46.67% were females. A total of 58.3% of the healthcare professionals were from Ambo, whereas 41.7% were from Gudar, and 75.0% belonged to the group with 1 to 5 years of experience (Table 1).

Table 1: Sociodemographic Features of the Participants

Variable	Categories	Frequency	Percentage
Sex	Male	64	53.33
	Female	56	46.67
Town	Ambo	70	58.3
	Gudar	50	41.7
Age	20-25	8	6.67
	26-30	35	29.17
	31-35	25	20.83
	36-40	23	19.17
	41-45	19	15.83
	46-50	8	6.67
	>50=6	2	1.67
Marital status	Married	69	57.50
	Single	51	42.5.0
Professions	Animal health assistance	2	1.67
	Doctor	1	0.83
	Nurse	49	40.83
	Other	22	18.33
	Pharmacy	19	15.83
	Veterinary laboratory technology	5	4.17
	Veterinary medicine	7	5.83
	Veterinary pharmacy	6	5.00
	Veterinary Clinician	9	7.50
Experience (in years)	1-5	90	75.00
	6-10	23	19.17
	11-15	4	3.33
	>15	3	2.50

Knowledge of Healthcare Professionals on Antimicrobial Usage and Antimicrobial Resistance

From the total respondents about 6.67%, 56.67%, 3.33%, 9.17%, and 4.17% were strongly agreed, agreed, indifferent, disagreed and strongly disagreed respectively on the statement that antimicrobials are effective against viral infections**.** The majority of health care professionals (47.50%) agree that if bacteria are resistant to antimicrobials (AMs), it can be very difficult to treat the infections they cause. Most healthcare professionals (HCPs) (40.83% agree) reported that AMR is only a problem for the people who take AMs regularly. About 39.17% of them agreed that antimicrobial classes use to treat bacterial infections in humans are also used in food-producing animals. About one third of the HCPSs (38.33%) agree, on statement 'the use of AMs in animals intended for food can result in resistant bacteria being transmitted to humans' (**Table 2**).

Table 3**.** Knowledge of participants about antimicrobial usage and resistance

Variables (knowledge assessment)	Participants answer (frequency (%))					
	SD	**DA**	**N**	**A**	**SA**	**Mean± SD**
AMs are effective against viral infections	5 (4.17)	28(23.33)	11(9.17)	68 (56.67)	8(6.67)	3.38 ± 1.05
AMs efficacy could not be reduced belonging sub recommended dosages used	3(2.50)	45(37.50)	29(24.1)	36(30.0)	7(5.83)	2.99± 1.00
Many infections are becoming increasingly resistant to treatment by antimicrobials	24(20.00)	23(19.17)	2(1.67)	44(36.6)	27(22.50)	3.23±1.49
If bacteria are resistant to antimicrobials, it can be very difficult to treat the infections they cause	19(15.83)	25(20.83)	0	57(47.50)	19(15.83)	3.26±1.37
AMR pathogen can infect anyone anywhere	2(1.67)	0	31(25.8)	52(43.33)	35(29.17)	3.98± 0.84
AMR occurs when your body becomes resistant to antimicrobials and they no longer work as well	4(3.33)	0	31(25.8)	56(46.67)	29(24.17)	3.88±0.89
AM infection can lead to longer hospital stay, higher medical costs and more deaths	5(4.17)	0	29(24.1)	47(39.17)	39(32.50)	3.95±0.97
AMR is only problem for people WHO take antimicrobials regularly	4(3.33)	0	30(25.0)	49(40.83)	37(30.83)	3.95±0 .92
Over and under use of AMs can cause antimicrobial resistant microorganism	4(3.33)	0	21(17.5)	21(17.50)	35(29.1)	4.01±0.87
AM classes used to treat bacterial infections in human are also used in food producing animals	2(1.67)	0	36(30.0)	47(39.17)	35(29.17)	3.95±0.86
Use of AMs in animals intended for food can result in resistant bacteria being transmitted to human	2(1.67)	0	36(30.0)	46(38.33)	36(30.00)	3.95±0.86
Antimicrobial resistant-microbes are found in people, animals, food, and the environment	1(0.83)	0	34(28.3)	52(43.33)	33(27.50)	3.96±0.79
Poor infection control ,inadequate sanitary conditions and inappropriate food handling encourage the spread of antimicrobial resistance	5(4.17)	0	34(28.3)	45(37.50)	36(30.00)	3.89±0.97
Human and animals are susceptible to the same disease causing microbes including antimicrobial resistant pathogens	3(2.50)	0	36(30.0)	47(39.17)	34(28.33)	3.90±0.89

Attitude of HCPs toward AMU and AMR

In this study, only about 11.67% of the healthcare professionals strongly agreed on the statement that antimicrobial resistance is a worldwide problem. Most health care professionals (48.33%) believe that inappropriate antimicrobial use can lead to resistance. The application of one health approach is important to control antimicrobial resistance (45.00% agree, 22.50 neutral, 18.33% disagree, 12.50% strongly agree and 1.67% strongly disagree). Nearly half of the respondents (42.50%) agree that the link between the health humans and animals and their environments is important in preventing AMR. Nearly half of HCPSs (42.50%) strongly disagree, regarding the statement that 'more vigilant use of AMs would decrease AMR'. About (40.00%) of HCPS agree on the narration 'broad spectrum antibiotics should be used in place of narrow spectrum antibiotics to reduce the resistance' (**Table 3**).

Table 4**:** Attitude of healthcare professionals regarding AMU and AMR

Variables (attitude related)	**Respondents answer (frequency) (%))**					**Mean± *SD***
	SD	**DA**	**N**	**A**	**SA**	
Inappropriate antimicrobial use can lead to resistance	2(1.67)	21(17.50)	17(14.17)	58(48.33)	22(18.33)	3.64 ± 1.03
Inappropriate antimicrobial use can lead to effective treatment	9(7.50)	31(25.83)	23(19.17)	45(37.50)	12(10.00)	3.16±1.14
Antimicrobial resistance is worldwide problem	4(3.33)	27(22.50)	28(23.33)	47(39.17)	14(11.67)	3.33±1.06
Antimicrobial resistance is problem in Ethiopia	3(2.50)	21(17.50)	27(22.50)	44(36.67)	25(20.83)	3.6±1.083
Antimicrobial resistance is problem in your working area	0	4(3.33)	22(18.33)	46(38.33)	48(40.00)	4.15±0.84
Microbiology lab result must be provided to the treating physician	1(0.83)	27(22.50)	25(20.83)	45(37.50)	22(18.33)	3.5±1.06
Restriction of antimicrobial impair the ability to provide good patient care	1(0.83)	15(12.50)	25(20.83)	63(52.50)	16(13.33)	3.65±0.894
More cautious use of antimicrobials would decrease antimicrobial resistance	51(42.5)	2(1.67)	26(21.67)	0	41(34.17)	2.81±1.75
Broad spectrum antibiotics should be used in place of narrow spectrum antibiotics to reduce resistance	9(7.50)	25(20.83)	30(25.00)	48(40.00)	8(6.67)	3.18±1.074
Application of one health approach is important to control antimicrobial resistance	2(1.67)	22(18.33)	27(22.50)	54(45.00)	15(12.50)	3.48 ±0.99
AMU and AMR surveillance in animals is important to control AMR in humans	4(3.33)	27(22.50)	33(27.50)	48(40.00)	8(6.67)	3.24±0.99
AMU and AMR surveillance in humans is important to control AMR in animals	0	26(21.67)	39(32.50)	47(39.17)	8(6.67)	3.30±0.89
It is crucial to educate our society about the danger behind the overuse and misuse of antimicrobial in human and animals	1(0.83)	18(15.00)	34(28.33)	50(41.67)	17(14.17)	3.53±0.94
The extensive use of antimicrobials in human medicine can accelerate the emergence and the spread of resistant microorganisms to animals	54(45.00)	5(4.17)	28(23.33)	0	33(27.50)	2.61±1.68
The extensive use of antimicrobials in veterinary medicine can accelerate the emergence and the spread of resistant microorganisms to humans	1(0.83)	27(22.50)	36(30.00)	46(38.33)	10(8.33)	3.31±0.94
Link between the health of humans and animals and their environments are important in preventing antimicrobial resistance	3(2.50)	14(11.67)	41(34.17)	51(42.50)	11(9.17)	3.44 ± 0.91
Establish microbiologic diagnostic facilities and conduct regular antimicrobial sensitivity tests necessary to combat antimicrobial resistance.	4(3.33)	15(12.50)	29(24.17)	52(43.33)	20(16.67)	3.58±1.01

Total Knowledge and Attitude Measurement

The mean ± SD of knowledge was 59.54 ± 10.12% (**Table 4**). The maximum score and minimum score of knowledge are 88.24 and 36.76, respectively. This indicated that most of the respondents had moderate knowledge regarding antimicrobial usage and resistance development. For attitude, the mean and standard deviation were 61.45 and 7.59, respectively. This finding revealed that, on average, the respondents have a positive attitude towards antimicrobial usage.

Table 5: Summary of total mean knowledge level scores and attitude of the participants

Variables	Number of Questions	Range of Score	Mean ± SD	Minimum value	Maximum value
Knowledge score	14	0-100	59.54 ± 10.12	36.76	88.24
Attitude score	17	0-100	61.45 ± 7.59	39.29	75

Practices of Healthcare Professionals toward Antimicrobial Usage and Antimicrobial Resistance

In terms of practice related to prescribing, 41.67% always, 21.67% never and 36.67% were occasionally using national medical antimicrobial prescription guidelines. A total of 30.83%, 22.50% and 46.67% of healthcare professionals responded that they prescribed antimicrobials for viral infections always, never, and occasionally, respectively. About 60% HCPSs were never prescribe antimicrobials based on their antimicrobial susceptibility laboratory results. Nearly half (44.17%) of the respondents were occasionally on taking part in antimicrobial awareness campaigns to promote the optimal use of AMs. About 40.00% of the participants were never attended antimicrobial resistance-related trainings Over all, the respondents do (practices) were bad and exacerbate the development of AMR (Table 6).

Table 7: Practice of healthcare professionals toward AMU and AMR

Practice related questions	Always	Never	Occasionally
Usage of national medical antimicrobial prescription guide line	50(41.67%)	26(21.6%)	44(36.67%)
Storing antimicrobials according to manufacturer's instruction	48(40.00%)	29(24.17%)	43(35.83%)
Check expire date of antimicrobials	55(45.83%)	20(16.67%)	45(37.50%)
Prescribe antimicrobials for viral infections	37(30.83%)	27(22.50%)	56(46.67%)
Prescribe antimicrobials based on their antimicrobial susceptibility laboratory result	3(2.5%)	72(60 %)	45(37.50%)
Dispensing antimicrobial on prescription with complete clinical information	45(37.50%)	30(25.00%)	57(47.50%)
Collaborating with other health professionals for infection and antimicrobial resistance control	32(26.67%)	34(28.33%)	54(45.00%)
Communicate with prescribers incase unsure about the appropriateness of an antimicrobial prescription	32(26.67%)	43(35.83%)	45(37.50%)
Taking part in AM awareness campaigns to promote the optimal use of antimicrobials	21(17.50%)	46(38.33%)	53(44.17%)
Instructing patients on the use of AMs, and resistance related issues	39(32.50%)	33(27.50%)	48(40.00%)
Make efforts to prevent or reduce the transmission of infections within the community	32(26.67%)	37(30.83%)	51(42.50%)
Have you attended antimicrobial resistance related trainings?	72(60.00%)	48(40.00%)	0

Association of KAP with Sociodemographic Profile of Respondents

Concerning the knowledge-related all personnel profile were not significant predictors of antimicrobial usage and antimicrobial resistance among health care professionals. Respondent attitude was significantly influenced by sex (x^2= 6.70, P-value=0.01) and age ($x^{2=}$13.74, P-value=0.03). The majority of healthcare professions in Ambo Town had a moderate degree of competence. Three respondents with an experience of more 15 years has a low level of knowledge in 100% of cases. The majority of HCPs with limited knowledge are single in terms of marital status. Many respondents had more than 15 years of experience and low knowledge levels (**Table 6**).

Table 6: Association of Knowledge and Attitudes score levels with Demographic Factors

Variables	Categories	Number of Respondents	Knowledge, Freq. (%)					Attitude, Freq. (%)			
			High	Moderate	Low	X^2	P value	Positive	Negative	X^2	P value
Town	Gudar	50	2(4.0)	45 (90.0)	3 (6.0)	2.84	0.242	45(90.0)	5 (10.0)	1.22	0.269
	Ambo	70	9 (12.86)	58 (82.86)	3 (4.29)			58 (82.86)	12 (17.14)		
Sex	Female	56	2(3.57)	4(7.14)	50(89.29)	4.69	0.09	53(94.64)	3(5.36)	6.70	0.01
	Male	64	9(14.06)	2(3.13)	53(82.81)			50(78.13)	14(21.88)		
Age	20-25	8	0(0.00)	1(12.50)	7(87.50)	13.60	0.327	8(100.00)	0(0.00)	13.74	0.03
	26-30	35	3(8.57)	1(2.86)	31(88.57)			34(97.14)	1(2.86)		
	31-35	25	1(4.00)	4(16.00)	20(80.00)			21(84.00)	4(16.00)		
	36-40	23	4(17.39)	0(0.00)	19(82.61)			20(86.96)	3(13.04)		
	41-45	19	2(10.53)	0(0.00)	17(89.47)			13(68.42)	6(31.58)		
	46-50	8	1(12.50)	0(0.00)	7(87.50)			5(62.50)	3(37.50)		
	>50	2	0(0.00)	0(0.00)	2(100.00)			2(100.00)	0(0.00)		
Marital status	Married	69	10(15.00)	9(13.00)	50(78.00)	7.43	0.41	50(78.00)	19(27.00)	4.93	0.29
	Never married	51	10(8.33)	24(20.0)	36(85.71)			33(78.57)	9(21.43)		
Profession	AHA	2	0(0.00)	0(0.00)	2(100.00)	7.87	0.95	2(100.00)	0(0.00)	8.59	0.38
	Doctor	1	0(0.00)	0(0.00)	1(100.00)			1(100.00)	0(0.00)		
	Nurse	49	4(8.16)	4(8.16)	41(83.67)			43(87.76)	6(12.24)		
	Others	22	3(13.64)	1(4.55)	18(81.82)			19(86.36)	3(13.64)		
	Pharmacy	19	2(10.53)	0(0.00)	17(89.47)			15(78.95)	4(21.05)		
	VLT	5	0(0.00)	1(20.00)	4(80.00)			3(60.00)	2(40.00)		
	Vet. Medicine	7	1(14.29)	0(0.00)	6(85.71)			7(100.00)	0(0.00)		
	Vet. Pharmacy	6	0(0.00)	0(0.00)	6(100.00)			4(66.67)	2(33.33)		
	Veterinary Clinicians	9	1(11.11)	0(0.00)	8(88.89)			9(100.00)	0(0.00)		
Experience (In year)	1-5	90	8(8.89)	4(4.44)	78(86.67)	5.49	0.48	75(83.33)	15(16.67)	2.18	0.54
	6-10	23	2(8.70)	1(4.35)	20(86.96)			21(91.30)	2(8.70)		
	11-15	4	1(25.00)	1(25.00)	2(50.00)			4(100.00)	0(0.00)		
	>15	3	0(0.00)	0(0.00)	3(100.00)			3(100.00)	0(0.00)		

DISCUSSIONS

In the current study, majority of the respondents, in this case health care professionals (HCPS) were males, and professional most of them were nurses. Seventy-five percent of them had an experience of 1-5 years. Many respondents had more than 15 years of experience albeit they had low knowledge levels. In this study, the majority (56.67%) of respondents agreed that antibiotics were effective against viral infections. This is in agreement with the findings of Sobeck *et al*. (2021), in which 57% of respondents in the United States thought that antibiotics could cure a viral infection. Although the level of knowledge varies, the current finding was nearly in line with another conducted in Romania; were 37.51% of respondents believed that antibiotics treat viral infections (Radosevi´c *et al*.,2009, Filipetto *et al*.,2008). These inadequacies of knowledge indicated that there is still a gap in administration of antibiotics which in turn aggravate the development of AMR.

According to the findings of this study, many participants (47.50%) agree that if bacteria are resistant to antimicrobials, it can be very difficult to treat the infections caused. The present finding is slightly declining from that of studies conducted in Bahir Dar (69.7%) (Geta and Kibret, 2022), Jordan (50%) (Darwish *et al*., 2014), and Namibia (72%) (Pereko and Essack, 2015). These variations may be the result of differences in professional understanding of bacterial resistant to antimicrobials.

The majority (40.00%) of health care professionals agreed on the statement that stated as antimicrobial use and antimicrobial resistance surveillance in animals is important to control antimicrobial resistance in humans. This finding was in discrepancy with a finding reported in Bangladesh where about 80.5% of the study participant confessed that AMR surveillance in animal is not important for AMR control in humans (Hassan *et al*., 2021). This variation might result from a lack of understanding.

The attitude of the study participants with regard to antimicrobial use and resistance is the perception and internal feeling that health care professions (HCPSs) possess towards antimicrobial stewardship, which may be positive or negative. In this study, only 11.67% of the respondents were strongly agree that antimicrobial resistance is a worldwide problem. This finding agreed with a report from Jordan where about 13% of the participant in line with the idea that AMR is the problem of the world to date (Darwish *et al.,* 2014). However, it is not similar to the study in Harar city (31%) in which participants appreciated that antimicrobial resistance is a problem worldwide. This difference is a result of the respondents' professional backgrounds.

Most (48.33%) healthcare professionals agree that inappropriate antimicrobial use can lead to resistance. There is significant variation between the studies in the Oromiya zone; 28.9% of respondents appreciated that irrational AMU can lead to antimicrobial resistance (Daniel *et al*., 2021). This result also differs from that of a study in Switzerland (63.7%) (Schwendner *et al.*,2020). A total of 45.6% of subjects agreed that antibiotic misuse leads to antibiotic resistance (Scaioli *et al*., 2015 Assar., 2020, Gualano *et al*.,2015). This discrepancy may be the result of inadequate instruction received while in school.

The majority of healthcare professions (42.50% responded strongly disagree) that more cautious use of antimicrobials would decrease antimicrobial resistance. In contrast to a study in Fetche Hospital, more than half (59%) of the respondents strongly disagreed that the more cautious use of antibiotics would decrease antimicrobial resistance (Tegagn *et al*., 2017). This variation may be caused by a misperception of how antibiotics are used.

In this study, the majority of health care professions (40.00% agreed) agreed that broad-spectrum antibiotics should be used in place of narrow-spectrum antibiotics to reduce resistance. There was variation in the study in Colombia, where 24.6% stated that it is better to prescribe broad-spectrum antibiotics to ensure that the patient is cured of the infection. In the study in Fetche hospitals, thirty-five percent (35%) of the HCPSs responded that broad-spectrum antibiotics should be used in place of narrow-spectrum antibiotics to reduce resistance (Tegagn *et al*., 2017). This variation may be due to a lack of understanding about the use of broad- and narrow-spectrum antibiotics.

Practice is the activity of health care professions (HCPSs) toward antimicrobial stewardship. According to this study, 41.67% of the respondents always responded to the use of national medical antimicrobial prescription guidelines. There is variation among studies in certain zones central Oromiya; the majority (56.7%) of healthcare professionals had a trend of using AMR guidelines (Daniel *et al*., 2021), and 93% were animal producers in Vietnam (Pham *et al.,* 2019). There is much variation in studies in Vietnam. Luckily there is a lack of antimicrobial prescription guidelines.

In this study, 30.83% of health care professionals responded that they always prescribed antimicrobials for viral infections. In a study in Colombia, 11.8% of the HCPS stated that antibiotics are effective for treating viral infection. This investigation is dissimilar to a study conducted in Colombia, and much more variation 79% of respondents in China and 57% of respondents in the United States thought that antibiotics could cure viral infection (Sobeck., 2021; Yu *et al*.,2014). This variation may be due to a lack of practice-related antimicrobial usage.

The reliability of diagnostic and antibiotic sensitivity testing is posited to be crucial for responsible antimicrobial use, while in the present study, 25.83% of HCPSs resorted to prescribing antimicrobials based on their antimicrobial susceptibility laboratory results. This is not in accordance with previous studies in both veterinary (De briyne *et al.,* 2013, Coyne *et al*., 2016) and human medicine (Peterson *et al*., 2014). This conflict may be due to a lack of laboratory tests for antimicrobial susceptibility.

In the present study, (17.50%) HCPSs responded that they always take part in antimicrobial awareness campaigns to promote the optimal use of antimicrobials. This study was similar to those reported by (Burger *et al*., 2016). This is not the same as a study in South Africa, where forty percent of HCPS had attended or received training on antimicrobials (Sabiha *et al*., 2020). This dissimilarity may be due to a lack of awareness campaigns about antimicrobial use in this current study areas. Moreover, majority of HCPs (60.00%) responded they were always attended antimicrobial resistance-related training. This by far, more than same response given in Indian, where 31.8% of HCPSs have conducted training programs to improve AMU. This huge variation is due to a lack of

training related to antimicrobial resistance in the current study scenario. Another, earlier studies also reported that the majority of HCPSs believed that antimicrobial resistance-related training is a good management practice for reducing antimicrobial use (Coyne *et al*., 2018, Kramer *et al*., 2017).

CONCLUSION AND RECOMMENDATIONS

In conclusion, the majority of healthcare professionals, on average had moderate knowledge although they had positive attitude. There is lack of guidelines about how to use antimicrobials and antimicrobial awareness campaigns to promote the optimal use of antimicrobials. Hence, Professionals need to adhere to the antimicrobial usage guidelines and apply theoretical concepts in practice through their jobs. The study concluded that there was lack of knowledge, and malpractice albeit positive attitude towards AMU and resistance. This warrant continuing capacity building programs for the professionals on AM usage and resistance, and development field-friendly disease diagnosis and management tools are essentially in need to reduce AMR. On top of this local and national awareness campaigns regarding antimicrobial resistance and usage need to take place among communities of the areas.

Abbreviations

AMR: Antimicrobial usage; AMR: Antimicrobial resistance, AMU: Antimicrobial usage; CSA: Central statistics agency; FAO: Food and agriculture organization; HCPS: Healthcare Professional; KAP: Knowledge, attitude and practice; N: Neutral; SA: Strongly agree; SD: Strongly disagree; TLU: Tropical domesticated animals units; WHO: World health organization; SD: Standard deviation.

Conflict of Interest

All the authors declared that have no conflict of interest regarding the publication of the manuscript.

Data Sharing Statement

Data and materials used in this study will available from the corresponding author upon reasonable request and can be shared.

Ethics Approval and Consent to Participate

Before starting the research Wallaga University School of Veterinary Medicine Review Committee has seen the proposal and approved by minute reference number **VMERC 18/14/04/2022** as the study has no ethical or moral problem on the respondents. Written consent was prepared and shared each and every respondent. The respondents agreed with the purpose of the study as it was so clear and important. The participants were informed about the purpose of the study and parental/legal guardian informed consent was obtained for participants under the age of 18.

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