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Enhancing community awareness of antimicrobial use and resistance through community conversations in rural Ethiopia

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Abstract

Background Enhanced availability of veterinary drugs in Ethiopia has led to a growing use of these drugs in food-producing animals. However, the use of drugs in livestock is not commonly supervised by trained veterinarians. In addition, smallholder livestock producers often lack sufficient education and information about antimicrobial use to achieve the intended impact.

Methods We used Community Conversations to raise awareness and knowledge about antimicrobial use and resistance within rural communities. We used single-sex and mixed-gender discussion groups to explore community members' perceptions and practices regarding antimicrobial use and resistance.

Results The data revealed knowledge and behavioral patterns in antimicrobial use and resistance, which vary between communities based on gender roles and information sources. Initially, antimicrobial resistance was poorly understood, but gradually, frequent drug use, poor-quality medications, poor regulatory system, and poor veterinary service emerged as key contributors. Although communities recognized the importance of preventive measures to reduce antimicrobial use, knowledge gaps and resource constraints limit their implementation.

Conclusions Raising awareness and knowledge within rural communities is an effective approach to promoting behavior change about antimicrobial use and resistance. The insights gained from understanding community perceptions and practices can help develop targeted education and training programs for stakeholders involved in the antimicrobial supply chain.

Keywords Antimicrobial use, Antimicrobial resistance, Community conversations, Ethiopia

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Background

Antimicrobial resistance (AMR) is a growing global challenge to human and animal health [1]. AMR can occur due to improper prescribing and dispensing practices, inadequate animal healthcare facilities, and insufficient knowledge among livestock keepers about antimicrobials and the potential consequences [2]. AMR in humans and animals is caused by misuse, improper disposal, and the production of counterfeit antimicrobials [3], as well as poor infection prevention and control practices [4]. The rapid development of AMR in pathogens threatens human and animal health, causing treatment failures and increasing healthcare costs [3].

One of the five key strategic objectives of the Global Action Plan on AMR is to improve awareness and knowledge about antimicrobial resistance through effective communication, education, and training [5]. In low- and middle-income countries (LMICs), research on the knowledge, perceptions, and practices of rural communities regarding antimicrobial use and resistance in livestock is often limited [6, 7]. In Ethiopia, little information is available regarding antimicrobial usage in animals and the prevalence of AMR [8]. The surveillance capacity for AMR at the farm and national level is currently underdeveloped [9] and unregulated antimicrobial usage is a widespread practice [10]. Improper antimicrobial use, often without a proper diagnosis, is more prevalent in the intervention sites [8].

Raising awareness and knowledge within rural communities about responsible use and ways to reduce the use of antimicrobials in livestock is critical to addressing AMR risks in LMICs [11]. In Ethiopia, previous awareness-creation activities usually targeted animal health workers rather than livestock producers [9]. There has been little engagement with rural communities to address AMR through participatory processes [12]. Participatory community engagement can create opportunities for awareness creation and co-development of solutions by engaging community members and animal health workers in collaborative analysis, action, and learning processes [13, 14].

Community Conversations are a participatory way of engaging rural communities and local service providers in cooperative learning, introspection, and finding solutions together about a specific issue. They promote behavior change through shared knowledge and the influence of peers [15]. In livestock development, Community Conversations have been used as a participatory community engagement approach to change the mindsets and practices of livestock keepers regarding household gender relations and the handling of animal-source foods [16]. They have also promoted community awareness and knowledge regarding animal welfare and productivity [14].

This paper aims to support national efforts to combat AMR by raising awareness in rural communities about the responsible use of antimicrobials and preventive measures to minimize their need.

Methods

Description of the study sites

Two rural communities in Ethiopia, namely Dharito in the Yabello district of the Oromia region and Sine Amba in the Menz Gera district of the Amhara region, were selected for community discussions on antimicrobial use and resistance. These sites were part of the Consortium of International Agricultural Research Centres (CGIAR) program on livestock. The sites were selected based on livestock density, agroecology, agricultural production systems, and service availability. These criteria ensured diverse livestock farming conditions, enabling an examination of their influence on community perceptions and practices related to antimicrobial use and resistance.

The Menz Gera population practices Orthodox Christianity and identifies with the Amhara ethnic group. Whereas, in the Yabello district, the population belongs to the Oromo ethnic group, with the majority of the Borana community practicing traditional religious beliefs. Table 1 provides agroecology and production system descriptions of the intervention sites. The Menz Gera district is located at an altitude of 2800–3100 m above sea level and has different land features such as plains, mountains, gorges, and undulated areas. The district has an average annual rainfall of 900–1000 mm, which occurs in two distinct periods throughout the year. The mean annual temperature in the district is 12 °C. The main agricultural system in Menz Gera is a highland mixed crop-livestock production system, with crops being the dominant focus [17].

The Yabello district is an arid and semi-arid area [18]. The population in the district depends mainly on livestock production. The main livestock species are goats, cattle, sheep, and camels. The district has two rainy seasons with an average annual rainfall of 500 mm and an average temperature of 24 °C and the altitude ranges from 350 to 1800 m above sea level [19].

In the study sites, livestock production plays an important role in the livelihoods of communities. The main

Table 1 Description of the intervention sites [14]

Region	District	Community	Agroecology	Production system	Altitude (m)	Rainfall (mm)	Temperature (^{0}C)
Oromia	Yabello	Dharito	Dry lowland	Mixed crop-livestock	1800	500	24
Amhara	Menz Gera	Sine Amba	Moist highland	Mixed crop-livestock	3100	900–1000	12

challenges facing smallholder livestock keepers include feed and water shortages and the occurrence of animal diseases [20].

The community conversations approach

Community Conversations are participatory community engagement processes where trained facilitators guide community members in identifying issues, examining constraints, and developing solutions to address those issues [15, 21]. These conversations promote critical discussions and reflections among women and men community members and local service providers, leading to community actions and positive changes [22].

Using principles of participatory approaches, we developed a Community Conversations facilitation guide on AMU and AMR [23]. The guide provides content and facilitation guidance for the implementation and documentation of Community Conversations in the intervention sites. During the conversations, we used visuals, narrative stories, thought-provoking questions, and personal reflections. These interactive methods helped explore the gendered perspectives and behaviors of community members, raise their awareness about the use of antimicrobials, and understand the concept of antimicrobial resistance within a social context.

We formed a team of local facilitators, consisting of research and development partners, who were familiar with the communities and spoke the local languages. Six facilitators were selected and trained in the Community Conversation methodology. The team included one lead facilitator, two co-facilitators, two note-takers, and one community mobilizer. The training used hands-on and reflective learning methods, blending theory with practice. We also reviewed each discussion question with the facilitators to ensure they fully understood and could communicate them clearly to participants. In both sites, the local partners played key roles in adapting the discussions to the local context and leading and documenting the conversations.

In the Dharito community, the Community Conversations were held on the 18th and 19th of October 2019, and in the Sine Amba community on the 6th and 7th of November 2019. In both sites, we engaged 106 (45% female) community members and 10 (20% female) local service providers in the conversations. In selecting the participants, we ensured a wide range of opinions and perspectives among the participants to foster a more dynamic discussion, promoting collaborative learning and inspiring community actions.

Participants were selected from diverse community groups based on age, gender, and leadership roles to ensure a broad range of perspectives. We assumed that gender and age influence knowledge and practices related to livestock health, antimicrobial use, and resistance due to differing roles in animal husbandry. To explore household dynamics in access to knowledge and decision-making on antimicrobial use, we engaged male- and female-headed households, women in male-headed households, and youth in the discussions. The sample size was determined by thematic saturation, where data collection stopped when no new insights emerged. In participant selection, we also considered logistical constraints and diversity of representation. As this study used a qualitative methodology, we did not conduct power analysis, which is used in quantitative research to determine statistical significance. Instead, our focus was on the depth and richness of data rather than statistical generalizability.

In circular sitting arrangements that created a level playing field and a safe discussion environment, the Community Conversations happened in open spaces (such as under a tree or a convenient community place) running typically through 2–3 h and engaging about 50 participants in each community. In a world café setup [24], we held separate male and female discussion groups, followed by a plenary discussion, to understand community perceptions and practices on antimicrobial use and AMR awareness. Based on prior research, community members were expected to influence their household members, neighbors, and other community members by sharing information from the conversations using different informal spaces and networks [22, 25].

Discussion content and questions

The Community Conversations approach addressed the following topics and discussion questions (Table 2). The discussion questions served as a checklist to steer the conversations, while the use of probing techniques allowed for deeper exploration of the issues at hand.

Data collection and analysis

Qualitative data were collected using iterative process documentation techniques. We used a participant-led narrative approach to data collection guided by a predetermined set of discussion topics and questions. Data collection methods used were observation, interviews, storytelling, and reflections. The use of process note-taking and reflection tools made it possible to document the results of the conversations, think about the process, identify and summarize emerging patterns, analyze the outcomes, and draw valuable insights, which were recorded in conversation reports [26]. Through post-event reflection and meaning-making processes with the facilitators, we analyzed, interpreted, and validated the results, experiences, and contextual insights of the Community Conversations.

We did not conduct descriptive statistical analysis because the data were qualitative, consisting of text,

Table 2 Community conversation topics and discussion questions on AMU and AMR [26]

Topics	Discussion questions
Community understanding of antimicrobials	• What are antimicrobials? • How does the understanding of antimicrobials differ by gender?
Information and knowledge sources on antimicrobials	• What information and knowledge sources do women and men have on antimicrobials? • How trustworthy are the different information sources?
Sources and quality of veterinary drugs	• Where do women and men community members get veterinary drugs? • Which drug sources are trustworthy and preferred? • Who regulates the supply of veterinary drugs?
Gender differences in the use of antimicrobials	• How does the use of veterinary drugs vary by gender? • Do you use human drugs for veterinary purposes?
Community understanding of antimicrobial resistance, its causes, and effects	• How do women and men community members understand antimicrobial resistance? • What do you think are the causes of antimicrobial resistance? • What do you do with leftover and expired veterinary drugs? • What is your understanding of withdrawal periods for antimicrobials? • What do you think are the consequences of antimicrobial resistance in livestock and humans?
Preventive measures to reduce antimicrobial resistance	• What preventive measures can you take to reduce the use of antimicrobials? • How can women and men community members reduce antimicrobial resistance in livestock?

narratives, and opinions. According to Nowell and others [27], we used an inductive content analysis approach to analyze the reports and field notes for common themes to identify categories and emerging patterns [26]. We then highlighted these by including direct quotes from community members and local service providers. Furthermore, literature was used to support and give meaning and validity to the themes. We considered socio-cultural, demographic, and agroecological aspects when comparing the data from the intervention sites and participants.

Ethics statement

Ethics approval for this work was obtained from the Institutional Research Ethics Committee of the International Livestock Research Institute (ILRI-IREC 2018-24).

Results

Understanding of antimicrobials

In the study sites, we found that community members had a common understanding of antimicrobials. In Yabello, they viewed antimicrobials as medications used to treat sick animals. Female participants also considered traditional medications as antimicrobials. Similarly, in Menz Gera, community members described antimicrobials as antibiotics and anthelmintics used for treating sick animals. Table 3 provides a summary of the main findings.

Information and knowledge sources on antimicrobials

In Yabello, community members obtained information and advice on antimicrobials from veterinary drug stores, veterinary clinics, government vaccination officers, and community animal health workers (CAHWs). They received information and advice from these sources on the types of antimicrobials, where to administer the medication, the appropriate dosage, how long the treatment should last, and specific conditions to consider, such as pregnant animals not swallowing bolus. The community members viewed veterinary drug stores, veterinary clinics, and government vaccination officers as reliable and trustworthy information sources.

Similarly, in Menz Gera, community members used public veterinary clinics, researchers, private veterinary service providers, and other farmers to seek advice regarding the proper dosage, treatment duration, and withdrawal periods. However, there were gender differences in access to such information and advice. Community members reported that men had greater access to knowledge and information about antimicrobials as they have higher mobility, exposure, and confidence in reaching out to animal health workers, veterinary clinics, and pharmacies, as well as ownership of mobile phones and radios.

Sources and quality of veterinary drugs

In Yabello, community members viewed public veterinary clinics and private veterinary drug stores as preferred and trusted drug sources, since they had better storage facilities and provided reliable information and advice. They believed that drugs from veterinary drug stores are not exposed to sunlight, do not easily deteriorate, and can be stored for longer periods. They also identified roadside markets and CAHWs as additional drug sources. However, they expressed concerns about the quality of drugs obtained from these sources. A male participant commented, "we lack information about the drugs from roadside markets and CAHWs." Male community members claimed that they could recognize expired drugs. They asserted that drugs purchased from roadside markets often undergo a color change. For example, a male participant said, "oxytetracycline turns black when it expires." In contrast, female participants mentioned that they depend on CAHWs to help them check the expiry dates of drugs.

Similarly, community members in Menz Gera identified public veterinary clinics, research centers, private veterinary drug stores, and informal markets. They emphasized that public veterinary clinics were the main

Table 3 Summary of findings by intervention sites

Themes	Yabello	Menz Gera
Understanding of antimicrobials	Antimicrobials were considered medications for treating sick animals. Women also included traditional treatments.	Antimicrobials were understood as antibiotics and anthelmintics used for treating sick animals.
Sources of information on antimicrobials	Primary sources were veterinary drug stores, clinics, public officers, and CAHWs. Veterinary clinics and government officers were trusted sources.	Public veterinary clinics, researchers, private veterinary service providers, and other farmers were key sources. Men had greater access to information than women.
Sources and quality of veterinary drugs	Public veterinary clinics and private drug stores were trusted sources. Quality concerns from roadside markets and CAHWs.	Public veterinary clinics were the main source. Hesitance to buy from private drug stores and informal markets due to quality concerns.
Gendered use of antimicrobials	Women treated small animals (poultry, goats, sheep) with tablets, while men handled large animals with injections. Traditional treatments often preceded veterinary drugs.	No gender differences. Men and women took animals to public veterinary clinics and followed prescriptions. Community members rarely treated animals themselves.
Understanding of AMR, causes, and consequences	Initial difficulty understanding AMR; later associated with prolonged and frequent drug use, expired drugs, and underdosing. Concerns about poor drug regulation and veterinary services. Awareness of financial loss and reduced animal productivity.	Similar difficulty understanding AMR; later linked to expired or poor-quality drugs, underdosing, using drugs for unknown diseases, and lack of diagnostics. Similar awareness of economic impacts.
Withdrawal periods and handling of drugs	Limited awareness of withdrawal periods; consumption of animal products shortly after treatment. Leftover drugs were often kept for later use and expired drugs were disposed of in the open (termite mounds or latrines).	Some awareness of withdrawal periods, mostly due to fear of disease transmission, but unaware of drug residues. Leftover drugs were not stored; expired drugs were disposed of in toilets or burned; fear of harm to children.
Preventive measures and community actions	Recognized the importance of responsible drug use, vaccination, biosecurity, and nutrition but faced resource limitations.	Similar understanding; emphasized improved animal health services, particularly diagnostics and mobile treatment options.

source of veterinary drugs. During the conversations, they revealed hesitance to buy drugs from private veterinary drug stores and informal markets due to concerns about the quality or expiration of the drugs from these sources. A male participant commented, "the drugs could be kept for longer periods as there are not many people buying drugs from private drug stores." A female participant also said, "veterinary drugs are not commodities like coffee and sugar that one buys from shops." Community members asserted that they could recognize the quality of veterinary drugs through ways such as smell, changes in color, texture, and expiration dates.

Gendered use of antimicrobials

In Yabello, veterinary drug use differed between genders. Female participants reported treating diarrhea in small animals (poultry, goats, and sheep) using tablets. For poultry, they mixed human tetracycline with water or maize flour. For calves, they mixed human tetracycline with water and administered it orally. They treated sick sheep and goats by mixing crushed anthelmintic bolus with water. On the other hand, male participants reported that they treat large animals (cattle and camels) with antibiotic injections. They reported crushing tablets and mixing them with water to administer to sick animals. A male participant said, "if we don't have animal drugs at home, we use tetracycline in newborn camel calves to prevent infection."

On the other hand, in Menz Gera, there were no gender differences in antimicrobial use. Community members mentioned that they brought their animals to veterinary clinics and followed the prescriptions or advice of animal health workers. They claimed to adhere to the recommended treatment dosage and duration. They believed that sick animals would not be fully cured if the treatment was stopped prematurely. They argued that, although the animal might initially appear healthy, the disease could still be present and returned, making it more difficult to treat. A male participant expressed the belief that "either the first or the last administered drug would be effective, so the animal needs to receive the recommended treatment dosage and duration."

A step-wise approach to caring for sick animals

Community members often relied on traditional treatments as the first line of care for sick animals. In Yabello, if these treatments did not work, they would buy drugs from a veterinary store and administer the drugs themselves. They reported considering the age, size, and body condition of sick animals to determine treatment dosage and duration. A male participant said, "we only seek help from CAHWs when we face difficulty or when our attempts to treat animals fail. If CAHWs fail to provide treatment, we finally use a veterinary clinic." On the other hand, in Menz Gera, community members reported that they rarely treat their animals themselves because they lack knowledge about the disease, treatment methods, and the quality of drugs. However, they acknowledged

that some farmers treat their animals, particularly for gastrointestinal parasites, since they were familiar with the drugs commonly prescribed by animal health workers for common diseases.

Understanding of antimicrobial resistance

Community members found it difficult to understand antimicrobial resistance. Initially, they described it as a scenario where "drugs are effective for the animal." However, upon further exploration, they began to understand it as a situation where "diseases develop a tolerance to drugs over time."

During the conversations, community members shared their experiences and stories which demonstrated their growing understanding of drug resistance. For example, in Menz Gera, a male participant mentioned, "even after repeated treatments, sick animals do not always get better. We think that the disease is incurable, or that the animal is inherently diseased. Therefore, rather than trying repeated treatments, we prefer to sell the animal." Through these discussions, community members understood that pathogens can become resistant or tolerant to drugs over time. They shared stories about situations where animals showed no improvement after receiving veterinary drugs or instances where the drugs did not work.

Causes and consequences of drug resistance

Through the conversations, community members identified different causes of antimicrobial resistance. In Yabello, they mentioned incorrect antimicrobial use as the main cause of drug resistance. A male participant emphasized, "drug resistance occurs due to the frequent and prolonged use of the same drugs, as well as the use of expired drugs." Similarly, in Menz Gera, community members associated drug resistance with "the use of expired or poor-quality drugs, drugs for unknown diseases, and under-dose drugs." A male participant emphasized that "not completing the treatment duration could lead to the development of drug resistance." Additionally, other participants noted that "using poor-quality drugs could worsen the condition in sick animals, as the disease may become more tolerant to the drugs over time."

Community members identified poor diagnostic capacity as a critical gap in veterinary services. They reported that veterinarians often do not physically examine sick animals. As a male participant explained, "they commonly rely on farmers' disease descriptions and observation of clinical signs to prescribe drugs." Community members expressed concern that this practice could contribute to drug resistance.

They were also aware of the economic consequences of drug resistance. One male participant stated, "Not only do we waste money on drugs that don't work, but the animals also suffer from diseases, and their productivity declines, and in some cases, we may even lose animals due to incurable diseases."

Withdrawal periods and handling of drugs

Community members showed different levels of awareness about withdrawal periods and handling of leftover and expired drugs. In Yabello, community members were unaware of withdrawal periods for veterinary drugs. They reported consuming animal-source foods (milk and meat) and selling animals shortly after antimicrobial treatment. They were unaware of the potential health risks of consuming animal-source foods immediately after treating sick animals with antimicrobials. They believed that animal drugs do not affect humans. Conversely, in Menz Gera, community members showed some understanding of withdrawal periods for antimicrobial use, as demonstrated by their knowledge of avoiding the consumption of milk, eggs, and meat immediately after treating sick animals. However, the main reason for this was the fear of disease transmission from sick animals to humans. Upon further exploration, community members gained a growing awareness of the potential transmission of drug residues to humans through the consumption of animal-source foods, which could lead to the development of drug resistance in humans.

In Yabello, community members mentioned that they stored leftover drugs for future use and disposed of expired drugs in the open environment. A male participant said, "we dispose of expired drugs by burying them in termite mounds or latrine pits." On the other hand, in Menz Gera, community members stated that they do not keep leftover drugs for later use. However, they also acknowledged that some farmers keep leftover drugs for use on other animals. One participant shared a story about a farmer who bought drugs to treat sick animals and stored the unused drugs. However, they believed this practice should be discouraged. The community members were aware that storing leftover drugs for too long could cause them to expire and lose their effectiveness in treating sick animals. A female participant expressed a concern that "expired drugs could even be harmful and potentially kill animals." Some community members believed that "expired drugs could even lead to the development of diseases in animals." Due to concerns about children finding them, community members claimed to dispose of leftover or expired drugs in toilets or by burning them, rather than disposing of them in the open environment.

Preventive measures to reduce antimicrobial resistance

Community members believed that they had the opportunity to reduce the risk of antimicrobial resistance. They understood that using drugs responsibly could

Table 4 Community actions to reduce the spread of AMR [26]

AMU and AMR issues	Community actions
Limited awareness and knowledge of AMU and AMR among rural communities	• Share information with other community members • Do not use human drugs for veterinary purposes • Do not use expired drugs or treat animals with leftover drugs • Store drugs in a safe and clean place • Avoid consuming animal-source foods before the withdrawal periods for drugs • Reduce or use antimicrobials only when needed
Sources and quality of veterinary drugs	• Consult trained veterinarians and drug dispensers • Regulate the informal drug market
Infection prevention measures	• Regularly vaccinate animals to prevent infections • Improve sanitation of animal premises • Isolate sick and treated animals from the flock • Properly dispose of carcasses • Prepare balanced feed resources to improve animal nutrition

help reduce antimicrobial resistance. They also recognized measures to prevent disease infections, such as vaccination, biosecurity, and adequate nutrition (sufficient feed, water, and minerals). One male participant in Menz Gera mentioned that "good livestock husbandry could decrease the chances of animals getting sick and needing treatment." Another participant stated that "maintaining good animal health could save money on treatments." However, despite these beliefs, community members acknowledged that they faced challenges due to limited resources, limited knowledge, and poor animal health services to maintain the health and welfare of their animals.

Community actions to curb AMR

The Community Conversations aimed not only to explore community awareness, perceptions, and practices regarding antimicrobials and AMR but also to empower communities to curb AMR (Table 4). Community members were urged to promote and advocate for the responsible use of antimicrobials within their communities. This involved disseminating information from the conversations regarding antimicrobials to other community members and seeking information and advice from animal health workers on proper veterinary drug usage. Furthermore, community members acknowledged the role of preventive measures and were encouraged to enhance their infection prevention strategies. However, to implement these actions, community members demanded improved animal health services, which include access to regular vaccination services, mobile treatment options, diagnostic facilities, and animal health advice that can be accessed through mobile phones. In addition, they emphasized the importance of regulating informal drug markets to ensure safe and effective drug availability within the communities.

Local animal health service providers appreciated the knowledge shared by the communities and found the experience of engaging with communities educational and insightful. In Menz Gera, the animal health team leader emphasized the need to integrate community actions into their plan and maintain ongoing engagement with community members to address drug resistance. Likewise, local partners in Yabello recognized the role of community dialogues in raising awareness and knowledge within communities about antimicrobials and AMR. They emphasized the importance of conducting conversations at various levels within the veterinary drug supply chain, including livestock keepers, animal health experts, drug regulatory bodies, and drug dispensers.

Discussion

In Ethiopia, AMR in veterinary practices remained unveiled, and evidence on antimicrobial usage is limited [8]. This paper explored awareness of antimicrobials and resistance among rural communities. While there were some differences between the intervention sites, we found limited awareness and knowledge within rural communities about antimicrobial use and the causes and effects of antimicrobial resistance.

In both sites, community members were unaware of antimicrobial-resistant pathogens, rather when therapeutic failure happened, they assumed it could be due to either uncurable disease or inherent disease. However, while it was initially difficult for community members to understand antimicrobial resistance, they could gradually describe situations that showed their growing understanding of treatment failures in animals. This was consistent with Pearson and Chandler [2] who show that human and animal healthcare professionals identify AMR mainly by observing treatment failures and persistent illness or lack of improvement after antimicrobial treatment.

The findings revealed knowledge and behavioral patterns in antimicrobial use and resistance, which vary across communities. Compared to Yabello, community members in Menz Gera demonstrated better awareness of antimicrobial use and resistance. This may be because of relatively better access to veterinary and advisory services. In Yabello, antimicrobials are poorly stewarded and easily obtained over the counter with minimal drug regulation, oversight, or quality control. As a result, to ensure the survival of their livestock, pastoralists often self-treat their animals with a risk of either overdosing or underdosing the sick animals [8]. In Yabello, common patterns of veterinary practices have led to community members becoming acquainted with them and subsequently trying to treat their animals. Animal health workers often advise

the same thing or prescribe the same medicine for common disease conditions. This may be due to the lack of diagnostic facilities and limited drug options. Similarly, Pearson and Chandler [2] show that both human and veterinary professionals have been employing antibiotics to treat viral infections. However, there have been issues with the improper dosing and duration of antibiotic treatments, as well as the use of low-quality antibiotics, including those that are illegal or past their expiration date, or those that have been stored in inappropriate conditions.

Pastoral communities in Yabello revealed the use of human tetracycline for veterinary purposes. The use of human tetracycline in animals has also been previously documented in the intervention area [8]. This practice has the potential to cause adverse drug reactions and contribute to the development and spread of antibiotic resistance between humans and animals [28].

While there were no gender differences in antimicrobial use in Menz Gera, women and men community members in Yabello showed differences in the type of antimicrobials used and animal species treated. Gemeda and others [8] show that livestock producers in pastoral systems use antibiotics more frequently than their counterparts in highland mixed crop-livestock systems, who mostly use anthelmintics. However, both women and men lack an understanding of the withdrawal periods for veterinary drugs and the public health risks of AMR. Zoonotic AMR pathogens in farm animals can transfer to humans through the consumption of contaminated water or food and direct contact with animals [29]. As women are more involved in cleaning barns, caring for sick animals, and processing animal-source foods, they can be more exposed to antimicrobial resistance risks [16, 30].

Enhancing awareness and knowledge within rural communities is key to promoting the rational use of antimicrobials and implementing improved prevention measures, which can reduce the use of antimicrobials. Previous studies show community education and awareness raising are the primary tools to change public behavior and tackle antimicrobial resistance [11, 31]. Community Conversations help explore community awareness and understanding of antimicrobials and resistance while encouraging community members to adopt improved preventive measures.

While the concept of antimicrobial use and resistance was not new to the local service providers, they found it difficult to communicate these issues to community members in an understandable way. They often play the role of experts [13] and fail to engage in exploratory discussions to learn from and problem-solve with community members and understand their perspectives [12]. Previous studies show the importance of improving the communication and advisory skills of animal health workers [13, 32, 33].

Limitations of the study

Effective awareness and behavior change within communities regarding antimicrobial use and resistance requires sustained engagement. Community conversations are not a one-time intervention, and ongoing engagement and follow-up visits are essential for lasting impact. While we involved local service providers as facilitators to encourage ownership and integrate community voices into local planning, our study was constrained by time limitations, preventing extended follow-up support. Future efforts should prioritize sustained community engagement, including discussions with a broader range of stakeholders in the drug supply chain to reinforce awareness, incorporate community perspectives, and develop strategic responses to antimicrobial resistance.

Conclusions

Awareness and knowledge of antimicrobial use and resistance in livestock are limited within rural communities in Ethiopia. Community Conversations show promise as a community engagement method to enhance awareness within rural communities and local service providers about antimicrobial use and resistance and how this could be reduced by rational antimicrobial use and implementing improved prevention measures. However, raising community awareness alone does not reduce the problem. Improvements in animal health services, better access to reliable information, and stronger regulatory enforcement are needed to translate awareness into action. This requires collaboration among stakeholders to explore differing perspectives, address constraints, and co-develop locally appropriate solutions.

Abbreviations

AMR	Antimicrobial resistance
CAHWs	Community animal health workers
CGIAR	Consortium of International Agricultural Research Centres
LMICs	Low- and middle-income countries

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Author contributions

The concept of the Community Conversations on antimicrobial use and resistance was developed by BA, ML, and BW. Fieldwork was conducted by BA and ML. The first draft of the manuscript was prepared by ML, expanded by BA, BW, KA, and TKJ, and then further revised by ML. All authors reviewed and approved the final version.

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Data availability
The data for this paper have been published as a field report and can be available at https://hdl.handle.net/10568/106395.

Declarations

Ethics approval
Ethics approval for this work was obtained from the Institutional Research Ethics Committee of the International Livestock Research Institute (ILRI-IREC 2018-24).

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

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References

1. Huttner A, Harbarth S, Carlet J, Cosgrove S, Goossens H, Holmes A, et al. Antimicrobial resistance: a global view from the 2013 world healthcare-associated infections forum. Antimicrob Resist Infect Control. 2013;2(1):31. https://doi.org/10.1186/2047-2994-2-31
2. Pearson M, Chandler C. Knowing antimicrobial resistance in practice: a multi-country qualitative study with human and animal healthcare professionals. Global Health Action. 2019;12(1). https://doi.org/10.1080/16549716.2019.1599560
3. Ferri M, Ranucci E, Romagnoli P, Giaccone V. Antimicrobial resistance: a global emerging threat to public health systems. Crit Rev Food Sci Nutr. 2017;57(13):2857–76. https://doi.org/10.1080/10408398.2015.1077192
4. Sartelli M, Hardcastle TC, Catena F, Chichom-Mefire A, Coccolini F, Dhingra S, et al. Antibiotic use in low and middle-income countries and the challenges of antimicrobial resistance in surgery. Antibiotics. 2020;9:497. https://doi.org/10.3390/antibiotics9080497
5. 2015; World Health Organization. Global action plan on antimicrobial resistance, Geneva, Switzerland. https://apps.who.int/iris/rest/bitstreams/864486/retrieve (accessed March 23, 2023).
6. Moffo F, Mouliom M, Kochivi FL, Dongmo JB, Djomgang HK, Tombe P et al. Knowledge, attitudes, practices and risk perception of rural poultry farmers in Cameroon to antimicrobial use and resistance. Prev Vet Med. 2020;182:105087. https://doi.org/10.1016/j.prevetmed.2020.105087. Epub 2020 Jul 11. PMID: 32726706.
7. Woldegeorgis BZ, Kerbo AA, Obsa MS, Mokonnon TM. A systematic review and meta-analysis of antimicrobial resistance knowledge, attitudes, and practices: current evidence to build a strong national antimicrobial drug resistance narrative in Ethiopia. PLoS ONE. 2023;18(6):e0287042. https://doi.org/10.1371/journal.pone.0287042
8. Gemeda BA, Amenu K, Magnusson U, Dohoo I, Hallenberg GS, Alemayehu G, Desta H, Wieland B. Antimicrobial use in extensive smallholder livestock farming systems in Ethiopia: knowledge, attitudes, and practices of livestock keepers. Front Vet Sci. 2020;7:55. https://doi.org/10.3389/fvets.2020.00055
9. Beyene AM, Andualem T, Dagnaw GG, Getahun M, LeJeune J, Ferreira JP. Situational analysis of antimicrobial resistance, laboratory capacities, surveillance systems and containment activities in Ethiopia: a new and one health approach. One Health. 2023;16. https://doi.org/10.1016/j.onehlt.2023.100527
10. Tefera B, Tilki T, Tefera N, Bayene Z, Belew S, Haftu R, et al. Antimicrobial resistance status of selected bacteria isolated from animal source foods and feed in Ethiopia. Ethiop Vet J. 2022;26(2):18–37. https://doi.org/10.4314/evj.v26i2.2
11. Mitchell J, Cooke P, Ahorlu C, Arjyal A, Baral S, Carter L, Dasgupta R, et al. Community engagement: the key to tackling antimicrobial resistance (AMR) across a one health context. Glob Public Health. 2022;17(11):2647–64. https://doi.org/10.1080/17441692.2021.2003839
12. Mitchell J, Arjyal A, Baral S, Barrington D, Cooke P, Fieroze F, et al. Co-designing community-based interventions to tackle antimicrobial resistance (AMR): what to include and why. BMC Res Notes. 2023;16:290. https://doi.org/10.1186/s13104-023-06449-1
13. Reyher KK, Barrett DC, Tisdall GA. Achieving responsible antimicrobial use: communicating with farmers. Pract. 2017;39:63–71. https://doi.org/10.1136/inp.j341
14. Lemma M, Doyle R, Alemayehu G, Mekonnen M, Kumbe A, Wieland B. Using community conversations to explore animal welfare perceptions and practices of rural households in Ethiopia. Front Vet Sci. 2022;9:980192. https://doi.org/10.3389/fvets.2022.980192
15. Lemma M, Kinati W, Mulema AA, Mekonnen M, Wieland B. Community conversations: a community-based approach to transform gender relations and reduce zoonotic disease risks. 2019. Nairobi, Kenya: ILRI. Available at: https://hdl.handle.net/10568/105818. (Accessed May 5, 2022).
16. Mulema AA, Kinati W, Lemma M, Mekonnen M, Alemu BG, Elias B, et al. Clapping with two hands: transforming gender relations and zoonotic disease risks through community conversations in rural Ethiopia. Hum Ecol. 2020;48:651–63. https://doi.org/10.1007/s10745-020-00184-y
17. Central Statistical Agency [Ethiopia], ORC Macro. Ethiopia Demographic and Health Survey 2005, ORC Macro. 2006. Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and. Available online at: https://www.dhsprogram.com/pubs/pdf/FR179/FR179[23June2011].pdf. (Accessed May 5, 2022).
18. Angassa A, Oba G. Herder perceptions on impacts of range enclosures, crop farming, fire ban and bush encroachment on the rangelands of Borana, Southern Ethiopia. Hum Ecol. 2008;36(2):201–15. https://doi.org/10.1007/s10745-007-9156-z
19. Wako G, Tadesse M, Angassa A. Camel management as an adaptive strategy to climate change by pastoralists in Southern Ethiopia. Ecol Processes. 2017;6:26. https://doi.org/10.1186/s13717-017-0093-5
20. Shapiro BI, Gebru G, Desta S, Negassa A, Nigussie K, Aboset G, Mechale H. Ethiopia livestock sector analysis: a 15-year livestock sector strategy. 2017; ILRI Project Report. Nairobi, Kenya: ILRI. Available at: https://hdl.handle.net/10568/92057. (2022). Accessed June 8,.
21. Carter E, Owens L, Swedeen B, Trainor A, Thompson C, Ditchman N, Cole O. Conversations that matter: engaging communities to expand employment opportunities for youth with disabilities. Teach Except Child. 2009;41(6):38–46. https://doi.org/10.1177/004005990904100605
22. Kotzé M, Seedat M, Suffla S, Kramer S. Community conversations as community engagement: hosts' reflections. South Afr J Psychol. 2013;43(4):494–505. https://doi.org/10.1177/0081246313508353
23. Alemu B, Lemma M, Magnusson U, Wieland B, Mekonnen M, Mulema A. Community conversations on antimicrobial use and resistance in livestock., Nairobi. Kenya: ILRI. https://hdl.handle.net/10568/106552
24. Lohr K, Weinhardt M, Sieber S. The world cafe as a participatory method for collecting qualitative data. Int J Qualitative Methods. 2020;19:1–15. https://doi.org/10.1177/1609406920916976
25. Chuang Y, Schechter L. Social networks in developing countries. Annu Rev Resour Econ. 2015;7:451–72. https://doi.org/10.1146/annurev-resource-100814-125123
26. Lemma M, Alemu B, Mekonnen M, Wieland B. Community conversations on antimicrobial use and resistance. Nairobi, Kenya: ILRI; 2019. https://hdl.handle.net/10568/106395
27. Nowell LS, Norris JM, White DE, Moules NJ. Thematic analysis: striving to meet the trustworthiness criteria. Int J Qualitative Methods. 2017;6:1–13. https://doi.org/10.1177/1609406917733847
28. Myers J, Hennessey M, Arnold JC, McCubbin KD, et al. Crossover-use of human antibiotics in livestock in agricultural communities: a qualitative cross-country comparison between Uganda, Tanzania, and India. Antibiotics. 2022;11:1342. https://doi.org/10.3390/antibiotics11101342
29. Dafale NA, Srivastava S, Purohit HJ. Zoonosis: an emerging link to antibiotic resistance under one health approach. Indian J Microbiol. 2020;60(2):139–52. https://doi.org/10.1007/s12088-020-00860-z
30. Garnier J, Savic S, Boriani E, et al. Helping to heal nature and ourselves through human-rights-based and gender-responsive one health. One Health Outlook. 2020;2:22. https://doi.org/10.1186/s42522-020-00029-0
31. Haenssgen MJ, Xayavong T, Charoenboon N, Warapikuptanun P, Zaw YK. The consequences of AMR education and awareness raising: outputs, outcomes, and behavioural impacts of an antibiotic-related educational activity in Lao PDR. Antibiotics. 2018;7(4):95. https://doi.org/10.3390/antibiotics7040095

32. Derks M, van Woudenbergh B, Boender M, Kremer W, van Werven T, Hogeveen H. Veterinarian awareness of farmer goals and attitudes to herd health management in the Netherlands. Vet J. 2013;198(1). https://doi.org/10.1016/j.tvjl.2013.07.018
33. Bard AM, Main DCJ, Haase AM, Whay HR, Roe EJ, Reyher KK. The future of veterinary communication: partnership or persuasion? A qualitative investigation of veterinary communication in the pursuit of client behaviour change. PLoS ONE. 2017;12(3):e0171380. https://doi.org/10.1371/journal.pone.0171380

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