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# Investigation of veterinary service delivery and service providers on dairy cattle farms in central Ethiopia

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## Abstract

**Background** Livestock diseases are major constraints affecting the productivity, health and welfare of animals in dairy sectors in Ethiopia. The prevalence of animal diseases and inadequate animal health services are key barriers to improving animal productivity and health. Studies assessing animal health delivery in Ethiopia are limited.

**Methods** A survey was conducted to assess veterinary service delivery on dairy farms, the level of service provision, and the major service providers in the area. A total of 381 dairy farms were recruited from different towns in central Ethiopia for the survey. Data were collected using a structured questionnaire developed via an online platform (<https://www.kobotoolbox.org/>) and administered via face-to-face interviews. The generated data were analyzed and descriptively summarized as frequency distributions and percentages.

**Results** The results of the present study revealed that a wide range of animal diseases have occurred and adversely affected the dairy farms in the study area. Several government and private veterinary service providers have been engaged in providing animal health care to dairy farms. Private veterinary services cover most of the veterinary services of dairy farms at selected sites in central Ethiopia. For veterinary services related to the treatment and control of external and internal parasites, the purchase of drugs, artificial insemination, assisted delivery and pregnancy diagnosis of animals, dairy farmers prefer private veterinary services. The government veterinary sector, on the other hand, was preferred the ability to vaccinate animals against major dairy animal diseases (36.3%) and provide health-related training services (21.8%). In this survey, 61.05% and 45.53% of the respondents were dissatisfied with high service charges and insufficient medicine for the treatment of major diseases, respectively. However, 76.3% and 75% of them were highly satisfied with the good skills of the veterinary professionals and with the recovery of their animals after treatment, respectively.

**Conclusion** The assessment of veterinary service delivery in dairy cattle management systems in central Ethiopia revealed that private veterinary service providers are the most dominant and that the comparative preference for private service, apart from its high comparative cost, may be related to its availability or accessibility. The overall users' satisfaction was reported to be low. It is advised that public veterinary services maintain professional freedom and acquire adequate physical and financial resources to carry out their tasks. Finally, privatization or the promotion of public-private partnerships should be supported to foster a competitive atmosphere for high-quality veterinary services.

**Keywords** Dairy farms, Public veterinary service, Private veterinary service, Service satisfaction, Ethiopia

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## Introduction

Agriculture remains the foundation of Ethiopia's economy [1], with livestock contributing 21% of the national gross domestic product (GDP), 49% of the agricultural GDP and 20% of export earnings [2]. The cattle population of Ethiopia is estimated to be approximately 70 million cattle, and the milk yield is increasing at a rate of 1.2% per year [3]. Similarly, 3.8 billion liters of milk are generated by 12 million dairy cows, over 95% of which are produced from local breeds [3]. Considering this, the majority of dairy producers are rural smallholders, which are characterized by traditional methods of animal husbandry and breeding [4].

Owing to the expanding population, rising earnings, and urbanization, the demand for milk and milk products has recently increased in Ethiopia [5]. However, the dairy sector is constrained by the scarcity of feed, poor access to veterinary services, lack of improved dairy animals, and limited extension services [6]. Most significantly, disease is a leading factor that affects the health and productivity of animals [7].

Diseases have a marked effect on dairy productivity by reducing milk production, impairing fertility, delaying puberty, lowering milk quality, and decreasing feed conversion [8]. Production diseases, such as mastitis, may not result in the death of animals but invariably reduce the productivity of the dairy sector [9]. Additionally, studies have shown that trypanosomiasis, pasteurellosis, contagious bovine pleuropneumonia, cowdriosis, anthrax, and blackleg are the most common diseases in Ethiopia that cause animal loss and hamper dairy farm productivity [10, 11]. According to a study by Welay et al. [11] involving mixed livestock production systems, ectoparasites and trypanosomiasis affect more than three-fourths of ruminant populations. Similarly, Duguma [12] reported that tick infestations are the most common (80% of farmers reported) in smallholder dairy farming in southwestern Ethiopia.

Veterinary services are defined as public and private entities that execute animal health and welfare measures to ensure the efficacy of the system under veterinary authority [13]. Improving the effectiveness of animal health systems by reducing the risk of animal diseases, supporting the sustainable economic growth of dairy producers, and reducing the threats that zoonotic diseases (those transmitted from animals to humans) bring to public health are essential [14]. Veterinary services fall into four broad categories: clinical services that include the treatment of diseased animals; preventive services that include vaccination, vector control; production of veterinary pharmaceuticals; and public health protection [15].

The availability and provision of high-quality animal health services is a critical step in assisting dairy

farmers in capitalizing on the growing demand for dairy products while simultaneously reducing hazards to both animal and human health [16]. Despite numerous initiatives over the past few decades, providing veterinary services to dairy farmers in Ethiopia faces challenges in terms of access and satisfaction [17]. Although few studies have been conducted in central Ethiopia [17], studies addressing the factors that affect animal health services in dairy production systems in Ethiopia are lacking. Specifically, studies addressing users' satisfaction and the effectiveness of veterinary care are limited. Therefore, this study was conducted with the objective of investigating the main veterinary service provider to determine the level of service provision and how well the veterinary service was delivered to dairy farms in the study area.

## Materials and methods

### Study area

The study was conducted in Adama, Asela, Mojo, Bishoftu, Dukem, and Holeta towns in central Ethiopia. These towns are renowned for having significant dairy development [7] and are also representative of both urban and peri-urban dairy farms in Ethiopia. A detailed description of the study area has been described in a previous study [18]. Figure 1 depicts the locations of the study sites in central Ethiopia.

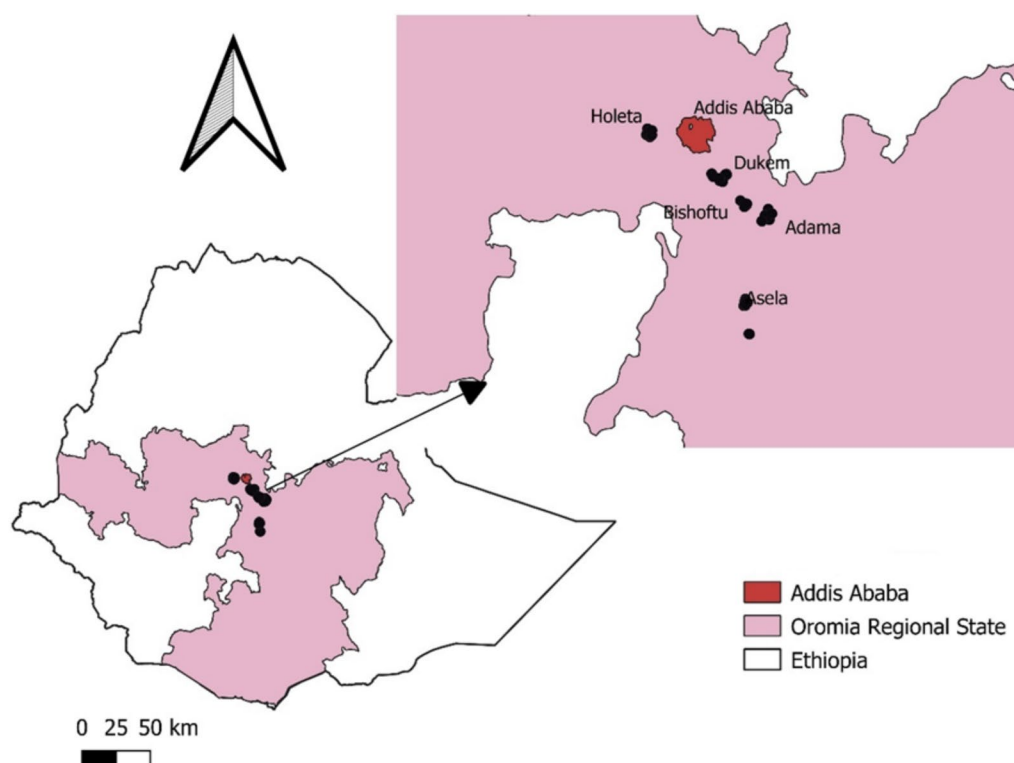
### Study design and sample size determination

A cross-sectional study was carried out from November 2021 to April 2022. The study units were individual small-scale dairy cattle keepers, small-scale cooperatives, and privately owned commercial farms from the respective towns. The dairy farms were identified with the help of employees of agriculture development offices of the respective towns. The random selection of farmers was impeded due to the lack of complete lists of dairy producers in each municipality.

To determine the appropriate sample size, the formula described by Thrusfield [19] was employed. For sample size calculation, we assumed that 50% of the dairy farms may have access to veterinary services, which was calculated via the following formula:

$$n = Z^2 * Pexp \left( \frac{1 - Pexp}{d^2} \right)$$

where  $Z = 1.96$  (95% confidence level),  $d$  = marginal error of 0.05,  $Pexp$  = proportion of interest assumed to be 50%, and  $1 - Pexp$  = proportion of dairy farmers who do not have access to veterinary service delivery. The calculated sample size was 384 dairy farms. Dairy cattle farms keeping at least one cow were eligible to take part in the study.



**Fig. 1** Locations of the study towns in central Ethiopia

### Data collection

Prior to data collection, verbal consent to participate in the study was obtained from the respondents after the objectives of the study were explained and the confidentiality of the information to be collected was assured.

Data were gathered through face-to-face interviews via a structured questionnaire. The questionnaire was designed in English using information derived from earlier studies (see supplementary material). Then, it was translated into two widely spoken local languages in the area (Amharic and Afan Oromo).

The online data collection platform KoboToolbox (<https://www.kobotoolbox.org>) was used for data collection via smartphones (Android version). The default server of Kobotoolbox, Amazon Web Services (AWS), was used to store the data. Finally, the translated questionnaire was subjected to pretesting on three respondents from each town, and those questions found to be ambiguous were amended. The collected data for the present study included the sociodemographics of the respondents, animal health service delivery, which included categories of services and types of veterinary service providers, annual vaccinations, concerns of farmers on curative and preventive medication, and their satisfaction with the service. A total of 14 services were used as indicators to assess veterinary service delivery by the

private and public sectors, whereas a total of nine items were used to assess service users' (dairy cattle keepers) satisfaction with the service provided to their farms. The selection of the different service types and indicators was based on the literature, given that national guidelines on the veterinary service criteria were not available at the time of the study.

### Data analysis

Descriptive statistics such as frequencies, percentages and averages were used to summarize the results. The services provided by the private and public sectors were converted into score values ranging from 0–14. A client would receive a score of 0 if he/she did not use any services or a score of 14 if he/she received all available services. Similarly, farmer satisfaction with the services they received was converted into a score scale ranging from 0 to 9. These eventually generated score values for the count response variables, which were analyzed via a negative binomial regression model, with the incidence rate ratio (IRR) used for assessing the associations. Statistical significance was determined with a  $p$  value of  $\leq 0.05$  (default approach). Negative binomial regression was selected because of its suitability for overdispersed data, as confirmed by a goodness-of-fit test following the Poisson regression test. This model was used to examine

factors associated with the utilization of available veterinary products and choices among service providers to dairy farmers in central Ethiopia. We checked for multicollinearity among the variables in the model via pairwise correlation and subsequently retained those variables with a correlation coefficient less than 0.5.

The model is specified as follows:

$$\log(Y_i) = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \beta_3 x_{3i} + \beta_4 x_{4i} + \beta_5 x_{5i} + \epsilon_i$$

where  $Y_i$  is the count of the choice of service providers for the  $i$ -th respondent.

-  $\beta_0$  is the intercept.

-  $\beta_1, \beta_2, \beta_3, \beta_4$ , and  $\beta_5$  are the coefficients for the respective predictors.

$\times 1, \times 2, \times 3, \times 4$ , and  $\times 5$  are independent variables representing town population size, distance from capital city, farm size, cattle breed, etc.

-  $\epsilon_i$  is the error term.

## Results

### Characteristics of farms and respondents

Data collected from a total of 380 survey dairy farm owners, managers or employees were used in the study. The questionnaires collected from four of the interviewed farmers were removed because they were incomplete. Disaggregated by towns/cities, 114 (Asela), 70 (Adama), 81 (Bishoftu), 63 (Holeta), 32 (Mojo) and 20 (Dukem) respondents were included in the study. When disaggregated by type of farm, the majority (356) were family owned (private smallholders), with 16 cooperatives and 8 large commercial businesses.

More than half (57.4%) of the respondents were female, whereas the rest were male. With respect to the educational status of the respondents, most of them had attended at least some primary education, and only a quarter of them (24.2%) did not have any formal education. Most of the farms (93.7%) were owned by families, and for 60.3% of the farms, dairy cattle keeping was the main source of income.

### Veterinary service providers and services for dairy farmers

Various animal health services are used by dairy farmers in central Ethiopia. Nearly three-fourths of the farmers reported that they never used animal health services for their cows, which included animal health-related training services, hoof trimming, surgical operations, male animal castration and laboratory diagnostic services. Overall, the majority of the farmers received veterinary services from private service providers. In this case, the types of animal health services used by at least 50% of the dairy farmers from private providers included treatment of sick animals (69.5%), pregnancy diagnosis (58.4%), assisted delivery when cows give birth (54.7%), artificial insemination (63.7%), purchase of drugs (74.9%) and mastitis treatment (61.6%). Among the different veterinary services assessed in the present survey, at most, only one-third of the farmers used government veterinary service providers (Table 1).

### Dairy farmer service satisfaction

The satisfaction of dairy farmers with the provided veterinary services was evaluated via eight measures,

**Table 1** Veterinary services and service providers commonly used by dairy farmers during the past year from the time of the survey in central Ethiopia ( $n = 380$ )

| Types of veterinary service              | Service providers (% of users) |            |          |            |
|--|--------------------------------|------------|----------|------------|
|  | Public                         | Private    | Both     | Never used |
| Animal health related training service   | 83 (21.8)                      | 16 (4.2)   | 6 (1.6)  | 275 (72.4) |
| External parasite treatment              | 44 (11.6)                      | 124 (32.6) | 23 (6.0) | 189 (49.7) |
| Internal parasite treatment              | 66 (17.4)                      | 204 (53.7) | 24 (6.3) | 86 (22.6)  |
| Treatment of sick animals                | 78 (20.5)                      | 264 (69.5) | 34 (9.0) | 4 (1.0)    |
| Hoof trimming                            | 7 (1.8)                        | 76 (20.0)  | 0 (0)    | 297 (78.2) |
| Surgical operations                      | 4 (1.0)                        | 22 (5.8)   | 0 (0)    | 354 (93.2) |
| Pregnancy diagnosis                      | 80 (21.0)                      | 222 (58.4) | 4 (1.0)  | 75 (19.7)  |
| Assisted delivery when cows giving birth | 35 (9.2)                       | 208 (54.7) | 4 (1.0)  | 133 (35.0) |
| Artificial insemination                  | 98 (25.8)                      | 242 (63.7) | 4 (1.0)  | 36 (9.5)   |
| Male animal castration                   | 12 (3.2)                       | 14 (3.7)   | 0 (0)    | 354 (93.2) |
| Laboratory diagnostic services           | 39 (10.3)                      | 41 (10.8)  | 0 (0)    | 300 (79.0) |
| Source for purchase of drugs             | 54 (14.2)                      | 285 (74.9) | 33 (8.7) | 12 (3.2)   |
| Vaccination service                      | 138 (36.3)                     | 133 (35.0) | 30 (8.0) | 106 (27.9) |
| Mastitis treatment service               | 38 (10.0)                      | 234 (61.6) | 13 (3.4) | 96 (25.3)  |

namely, the accessibility of the service provider, service cost, professional response time delay, the skill of the veterinary service provider, the satisfaction of the treatment outcome, the ability of facility service providers, the ability of service providers to have sufficient medicine for treatment and client satisfaction with the customer care of service providers. Most of the respondents were not satisfied with the cost incurred for examination and treatment services (61.1%) or the accessibility of service providers (47.6%). Most of the respondents were satisfied with the treatment outcomes (76.3%), the skills of professionals providing veterinary services (75.0%), the customer care of service providers (64.7%) and professionals' timely response when animal health problems occurred on their farm (62.1%). Approximately one-fifth of the respondents (21.6%) complained that veterinary service providers do not have adequate facilities to provide the required services (Table 2).

#### Factors affecting the choice of veterinary service providers

A negative binomial regression analysis revealed that the population size of towns, distance of towns from Addis Ababa, size of the farm, breed of animals and training on farm management were significant factors affecting farmers' choice/selection of preferences for animal health service providers ( $p$  value  $\leq 0.05$ ). On the other hand, the educational status of the respondents and farm ownership had no significant associations with the service provider selected (Table 5). Towns with a population size of  $\geq 100,000$  people had a higher IRR (1.53) for the choice of service providers than did smaller towns with a population size of less than 100,000. Compared with towns located less than 50 km from the capital city of Ethiopia, towns located 50 km or more from Addis Ababa presented a greater IRR (1.63) for the choice of service providers (Table 3).

#### Concerns of dairy farmers on curative and preventive medications

Ineffective drugs (27.1%), inadequacy of service providers (7.9%), and unavailability of drugs (2.4%) were concerns of dairy farmers in the study area (Table 4). With respect to vaccines, farmers stated that they were not easily accessible (68.4%) and were not protective against diseases (48.4%) (Table 4).

#### Vaccination practices of dairy farmers for priority diseases endemic to the current study area

The vaccination rate of dairy cattle against diseases was low, and the farmers vaccinated their animals against the diseases listed in Table 5 during the last year before the survey. For example, dairy animals have been immunized against foot and mouth disease (FMD), blackleg disease, lumpy skin disease (LSD), anthrax, contagious bovine pleuropneumonia (CBPP) and Pasteurellosis, with percentages of 32.1%, 26.6%, 23.4%, 18.4%, 3.2% and 1.8%, respectively (Table 5).

#### Discussion

The primary veterinary service provider in Ethiopia is the public sector. Accordingly, every district has a clinic, and health posts are found in almost every kebele (village administration) in rural settings. However, providing effective services to livestock keepers is not satisfactory. The participation of the private sector is limited in these rural settings [20]. The current survey findings indicated that the veterinary services provided to livestock keepers encompass disease control approaches (clinical services), animal health-related training, artificial insemination, pregnancy diagnosis and preventive measures (vaccination), with little emphasis on castration, laboratory diagnosis, surgical operations, hoof trimming, animal health-related training and external parasite control.

**Table 2** Farmers' level of satisfaction with the quality, availability, cost and reliability of animal health care services in central Ethiopia ( $n = 380$ )

| Criteria (statements) for satisfaction  | Satisfaction of respondents, n (%) |           |            |
|---|------------------------------------|-----------|------------|
|   | Agree                              | Neutral   | Disagree   |
| The location of the service provider is easily reachable (accessible)                   | 191 (50.3)                         | 8 (2.1)   | 181 (47.6) |
| Cost of the service for examination and treatment is fair                               | 116 (30.5)                         | 32 (8.4)  | 232 (61.1) |
| Professionals responded timely when animal health problems happened                     | 236 (62.1)                         | 16 (4.2)  | 128 (33.7) |
| Veterinary service providers have skilled professionals                                 | 285 (75.0)                         | 68 (17.9) | 27 (7.1)   |
| Client satisfaction with treatment outcomes   | 290 (76.3)                         | 40 (10.5) | 50 (13.2)  |
| Veterinary service provider has adequate facility to provide the required services      | 188 (49.5)                         | 82 (21.6) | 110 (28.9) |
| Veterinary service provider has sufficient medicine for the treatment of major diseases | 145 (38.2)                         | 62 (16.3) | 173 (45.5) |
| Client satisfaction with the customer care of service providers                         | 246 (64.7)                         | 18 (4.7)  | 116 (30.5) |



**Table 3** Factors affecting the choice of veterinary services between private and public veterinary services in central Ethiopia

| Variables                   | Levels            | Number (%) | Public IRR* | p value | Private IRR* | p value |
|-----------------------------|-------------------|------------|-------------|---------|--------------|---------|
| Town size                   | < 100,000 people  | 196 (51.6) | Ref         |         |              |         |
|                             | ≥ 100,000 people  | 184 (48.2) | 0.22        | 0.000   | 1.53         | 0.010   |
| Distance from Addis Ababa   | < 50 km           | 164 (43.2) | Ref         |         |              |         |
|                             | ≥ 50 km           | 216 (56.8) | 1.63        | 0.041   | 1.53         | 0.010   |
| Education                   | No education      | 92 (24.2)  | Ref         |         |              |         |
|                             | Primary           | 120 (31.6) | 1.21        | 0.384   | 0.96         | 0.731   |
|                             | Secondary         | 112 (29.5) | 1.61        | 0.025   | 0.88         | 0.303   |
|                             | College           | 56 (14.7)  | 1.88        | 0.014   | 0.75         | 0.069   |
| Farm ownership              | Family            | 356 (93.7) | Ref         |         |              |         |
|                             | Others            | 24 (6.3)   | 1.40        | 0.221   | 1.36         | 0.073   |
| Farm area                   | < 60              | 135 (35.5) | Ref         |         |              |         |
|                             | ≥ 60              | 151 (39.7) | 1.66        | 0.002   | 0.72         | 0.000   |
| Cattle breed                | Local             | 66 (17.4)  | Ref         |         |              |         |
|                             | Exotic/Cross-bred | 314 (82.6) | 0.52        | 0.001   | 1.75         | 0.000   |
| Training on farm management | No                | 275 (72.4) | Ref         |         |              |         |
|                             | Yes               | 105 (27.6) | 1.46        | 0.017   | 1.29         | 0.012   |
| constant                    |                   |            | 2.05        | 0.001   | 3.78         | 0.000   |

\* Incidence rate ratio (IRR)

**Table 4** Concerns of dairy farmers on curative and preventive medications for dairy farms in central Ethiopia

| Farmers Concerns on animal health care | Number (%) |
|--|------------|
| <b>Treatment of sick animals</b>       |            |
| Inadequacy of service providers        | 30 (7.9)   |
| Unavailability of drugs                | 9 (2.4)    |
| Cost of drugs                          | 2 (0.5)    |
| Ineffective drugs                      | 103 (27.1) |
| No drug for some diseases              | 6 (1.6)    |
| Sudden death                           | 6 (1.6)    |
| Negligence                             | 2 (0.5)    |
| <b>Vaccine related concerns</b>        |            |
| Less protective                        | 184 (48.4) |
| Cost of vaccine                        | 47 (12.4)  |
| Not easily available                   | 260 (68.4) |

There are few reports on veterinary services and their critical gaps in Sub-Saharan Africa [21]. In Ethiopia, livestock disease surveillance and reporting are not only poor but also very irregular, with only 30–35% of administrative zones submitting monthly disease outbreak reports [22].

In the current survey findings, almost all the respondents obtained veterinary services from private service providers. In contrast to the current findings, other previous studies reported that animal health services were exclusively provided by government animal health

**Table 5** Number of dairy farmers who reported being vaccinated against various diseases during the past 12 months before the survey in central Ethiopia

| Vaccination                       | Number (%) |
|-----------------------------------|------------|
| Foot and mouth disease            | 122 (32.1) |
| Lumpy skin disease                | 89 (23.4)  |
| Anthrax                           | 70 (18.4)  |
| Blackleg                          | 101 (26.6) |
| Contagious bovine pleuropneumonia | 12 (3.2)   |
| Pasteurellosis                    | 7 (1.8)    |
| Others                            | 28 (7.4)   |
| Overall                           | 217 (57.1) |

centers [12]. This disparity may be due to geographical differences in the study area because, in most rural villages and towns, there were no private veterinary service providers. Previous studies reported that public veterinary services were chosen as the first choice for effectiveness and costliness compared with private veterinary services, as the cost of clinical case treatment services and the cost of drugs are subsidized by the government in Ada'a district, central Ethiopia [23]. However, in the current study, private veterinary service providers were chosen as the first priority. This may be because the activities of public veterinary services are very limited related to inadequate budgets, logistic problems, a lack of basic veterinary equipment, and a

shortage of properly trained manpower at different levels. Additionally, distance covered to obtain a service is a determinant factor for choosing a service provider even though it is not mentioned in the current survey; it was previously described as a factor that determined the choice of a service provider in other production systems in Kenya [24] and Nepal [25].

Dairy farmers in the current study area demand veterinary services among alternative providers, which are governed by the accessibility, availability, quality, affordability, and timeliness of the services. The survey revealed that dairy farmers visit private veterinary service providers more frequently than their public counterparts do. The services provided in the current findings singled out private veterinary clinics as the most satisfactory service providers for the majority of dairy farmers. This can be explained by the frequent absence of veterinary supplies in most public entities as the result of budgetary constraints, negligence and recurrent turnover of veterinary personnel, and public bureaucratic issues along the supply chain. On the other hand, private veterinary service providers spend most of their time on duties to maximize their profits and expand their enterprises [20]. Therefore, in the present study, irrespective of the high cost, private veterinary services were preferred in most cases. This preference may be attributed to the accessibility and ease of obtaining services. In contrast, government veterinary clinics are often fixed at specific locations, which may make it impractical or unfeasible for farmers to transport dairy animals to these clinics in urban areas.

Some veterinary services were not widely utilized. This low utilization may be linked to the technical skills and facilities required for certain services. Services requiring minimal technical skills, such as deworming (treatment of internal parasites), may often be performed by farmers themselves because they are not technically complex. Conversely, procedures that demand advanced technical skills, such as surgical interventions, may not be available owing to the limited capacity of service providers in the area.

The availability of reliable veterinary services, accessibility, and quality of service determine the choice and satisfaction of farmers with respect to veterinary services [22, 26]. In the present survey, some of the respondents had vaccinated their animals in the last two years for the most common endemic diseases, such as foot and mouth disease (32.1%), blackleg (26.6%), lumpy skin disease (23.4%), anthrax (18.4%), contagious bovine pleuropneumonia (3.2%) and Pasteurellosis (1.8%). This finding was in line with findings of a previous study that reported that major FMD prevention measures were through vaccination [27]. Vaccination against blackleg is the major intervention tool, which can contribute to 9 (900%) rates

of return, and the net benefit per head is approximately USD 0.4 for local zebu cattle and USD 0.8 for crossbred cattle [28]. From the perspective of individual farmers, the prevention of zoonotic diseases, such as bovine brucellosis and tuberculosis, appears to be less prevented and controlled than do visible losses at the farm level, resulting in greater public health impacts, as previously reported by different researchers [29, 30].

Farmers' satisfaction with veterinary services often depends on several factors, including accessibility, affordability, effectiveness, timeliness, and the perceived technical quality of the services provided. Satisfaction is typically greater when services meet farmers' immediate needs and are delivered in a manner that aligns with their expectations and constraints. Approximately one-fourth (27.1%) of the farmers reported the low effectiveness of veterinary medicines, a figure that may be influenced by several interconnected factors. There could be potential for misdiagnosis and incorrect treatments, which can reduce the effectiveness of treatments. Farmers or service providers may rely on only clinical diagnosis, which can complicate the treatment courses provided and further compromise outcomes. Another potential factor for the ineffectiveness of the medicines could be the availability of substandard or counterfeit drugs in veterinary markets, which may contain insufficient active ingredients.

Nearly half (48.4%) of the farmers reported vaccines as ineffective, which may be related to several factors. For example, the improper storage and handling of vaccines, leading to a loss of effectiveness, can be one factor [31]. Moreover, there can be misunderstandings about how vaccines may also play a role, as some farmers may expect vaccines to be used to treat rather than prevent diseases [32]. This misunderstanding could also lead to low utilization. A lack of awareness or trust in the benefits of vaccination can lead to low uptake. In the present study, the sole vaccine production institute in Ethiopia (National Veterinary Institute) is in Bishoftu (one of the study sites and near other study towns), and physical availability/accessibility may not play a role in the low vaccination rates.

The potential limitation of the present study may be the inability to follow the full random selection of the respondents due to a lack of proper sampling frames. 'Snowball' sampling is the preferred procedure under the conditions of a 'hard-to-reach' population, and it is impractical to apply formal randomization procedures. Therefore, the results of the present study should be interpreted cautiously.

In conclusion, this study assessed veterinary service delivery in urban and peri-urban dairy production cattle management systems in central Ethiopia. Private veterinary providers were found to be dominant

in most of the various services. Even though private veterinary services are thought to be more effective, people are not satisfied. There has been considerable dissatisfaction, particularly with high service prices but still using the service may be due to availability/accessibility. Therefore, it is recommended that privatization or public–private partnership be supported to create a competitive environment with the goal of improving the general quality of veterinary services.

## Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12917-025-04599-x>.

Supplementary Material 1.

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## Authors' contributions

Girma Kebede: Methodology; Writing – original draft; Nebyou Moje: Investigation; Writing – review & editing; Ayisha Shafi: Investigation; Redeat Kassahun: Investigation; Olana Merera: Writing – review & editing; Samson Leta: Funding acquisition; Writing – original draft; Hika Waktole: Funding acquisition; Project administration; Writing – original draft; Bekele Megersa: Formal analysis; Writing – original draft; Supervision; Kebede Amenu: Conceptualization; Funding acquisition; Methodology; Project administration; Supervision; Writing – review & editing; All authors made critical contributions in revising the manuscript and approved the final version.

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## Data availability

The data can be obtained from the corresponding author upon request.

## Declarations

### Ethics approval and consent to participate

The study was approved by the Research Ethical Committee of the College of Veterinary Medicine and Agriculture of Addis Ababa University. All methods were carried out in accordance with the applicable guidelines and regulations. Verbal informed consent was obtained from the study participants for their voluntary participation and anonymous reporting of the results of the study, and this process was approved by the ethical committee.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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