Research Article

An Investigation of the Common Factors Affecting Disease Incidence in Dairy Cows: A Case Study of Smallholder Dairy Farms in Shashemene District

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Abstract

Dairy farming played a vital role in the livelihoods of smallholder farmers in Ethiopia, but disease incidence remained a major challenge, affecting productivity and farm profitability. This study investigated the common factors influencing disease occurrence in dairy cows, focusing on smallholder farms in Shashemene District. A cross-sectional study design was employed, combining survey questionnaires, key informant interviews, and direct farm observations to assess disease prevalence and management practices. A total of 17 rural kebeles were selected using stratified random sampling, and statistical analyses, including descriptive statistics, chi-square tests, and logistic regression, were conducted to identify significant risk factors. The results indicated that mastitis (35.2%), gastrointestinal parasites (41.8%), and foot and mouth disease (28.7%) were the most prevalent diseases. Poor farm management practices, including poor hygiene (67.2%), lack of vaccination (58.4%), and seasonal feed shortages (63.0%), were found to be strongly associated with disease incidence (p < 0.05). Logistic regression analysis further identified poor hygiene (OR = 3.12), lack of vaccination (OR = 2.81), and overcrowding (OR = 2.45) as significant predictors of disease occurrence. Additionally, qualitative findings from key informant interviews highlighted limited veterinary services, economic constraints, and traditional disease management practices as major challenges faced by farmers. This study concluded that improved farm hygiene, regular vaccination, better feed management, and enhanced veterinary services were critical for reducing disease prevalence in smallholder dairy farms. The findings provided important insights for policymakers, veterinarians, and agricultural extension workers in developing targeted interventions to enhance livestock health and productivity. Further research was recommended to assess the long-term impact of improved disease control strategies on dairy farm profitability.

Keywords

Dairy Cows, Disease Incidence, Smallholder Farming, Farm Management

1. Introduction

1.1. Background of the Study

Dairy farming plays a critical role in the livelihoods of smallholder farmers in Ethiopia, contributing to household income, nutrition, and food security [10]. The dairy sector in Ethiopia is primarily composed of smallholder farmers who rear cattle under traditional management systems. However, despite its economic importance, the dairy industry faces multiple challenges, with disease incidence being one of the most significant [5]. Various infectious and non-infectious diseases affect dairy cows, leading to economic losses due to reduced milk yield, increased veterinary costs, and mortality.

The Shashemene District, located in the Oromia Region of Ethiopia, is one of the major dairy-producing areas. Many smallholder farmers in the district depend on dairy farming for their livelihoods. However, frequent disease outbreaks, inadequate veterinary services, and suboptimal farm management practices negatively impact dairy productivity [6]. The main dairy cow diseases in the area include mastitis, foot and mouth disease (FMD), bovine tuberculosis, and parasitic infections [3]. These diseases not only affect milk production but also have broader implications for public health, especially for zoonotic diseases.

Several factors contribute to disease occurrence in dairy farms, including poor hygiene, inadequate housing, improper feeding, and lack of preventive health measures such as vaccination and deworming [1]. Additionally, climate conditions, water quality, and limited knowledge among farmers about disease prevention strategies exacerbate the problem. Understanding the common factors affecting disease incidence is crucial for developing effective disease control strategies, improving dairy productivity, and enhancing the livelihood of smallholder farmers in the district.

This study aims to investigate the key factors influencing disease incidence in dairy cows in smallholder farms in Shashemene District. The findings will provide insights into the most pressing health challenges and offer recommendations to improve disease management practices among dairy farmers.

1.2. Statement of the Problem

Dairy farming is a vital economic activity in Shashemene District, yet farmers continue to experience substantial losses due to high disease incidence among their herds. Reports indicate that major dairy cow diseases such as mastitis, lumpy skin disease, foot and mouth disease, and gastrointestinal parasites are prevalent in the area [7]. These diseases contribute to reduced milk production, increased mortality rates, and a higher cost of treatment, which negatively affects farmers' livelihoods.

A key challenge is the lack of adequate veterinary services, which limits access to disease prevention and control measures. Many smallholder farmers also have limited knowledge of best management practices for maintaining animal health [2]. Poor housing conditions, improper nutrition, and unhygienic milking practices further contribute to disease outbreaks. In addition, climate variability and seasonal changes in feed availability exacerbate the risk of disease transmission [9].

While some studies have examined specific dairy cow diseases in Ethiopia, limited research has been conducted on the comprehensive factors influencing disease incidence in smallholder dairy farms in Shashemene District. Therefore, this study aims to bridge this gap by identifying the major contributing factors and suggesting practical solutions to enhance dairy health management in the district.

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of this study was to investigate the common factors affecting disease incidence in dairy cows among smallholder farms in Shashemene District.

1.3.2. Specific Objectives

1) To assess the prevalence of major dairy cow diseases in smallholder farms.
2) To identify key farm management practices influencing disease incidence.
3) To evaluate the impact of environmental and climatic factors on disease occurrence.
4) To provide recommendations for improving disease prevention and control strategies.

1.4. Research Questions

1) What were the most common diseases affecting dairy cows in smallholder farms in Shashemene District?
2) What were the major farm management factors that contributed to disease incidence?
3) How did environmental and climatic conditions affect the prevalence of dairy cow diseases?
4) What strategies were implemented to reduce disease occurrence and improve dairy productivity?

1.5. Significance of the Study

This study provided valuable information for dairy farmers, veterinarians, policymakers, and researchers. Understanding the major factors affecting disease incidence helped in designing targeted interventions to improve dairy cow health and productivity. Farmers benefited from practical recommendations on disease prevention and farm management, while policymakers used the findings to develop better livestock health policies and extension services. Additionally, the research

contributed to the body of knowledge on dairy cow health in Ethiopia and informed future studies in the field.

1.6. Scope and Limitations

This study focused on smallholder dairy farms in Shashemene District, specifically in 17 selected rural kebeles. The research assessed disease prevalence, farm management practices, and environmental factors affecting disease occurrence. However, the study was limited by the availability of accurate veterinary records and farmers' willingness to share data on disease cases. Additionally, seasonal variations in disease prevalence required longer-term studies to capture all influencing factors comprehensively.

2. Materials and Methods

2.1. Study Area Description

This study was conducted in Shashemene District, located in the West Arsi Zone of Oromia Region, Ethiopia. The district is well known for its dairy production, primarily operated by smallholder farmers. It consists of both urban and rural areas, with rural kebeles forming the major dairy-producing zones. Seventeen rural kebeles were selected for the study, considering their significant involvement in dairy farming. The district has a mixed crop-livestock production system, where cattle rearing is integrated with crop farming. The climate of Shashemene is characterized by bimodal rainfall, with the main rainy season from June to September and a short rainy season from March to May. The average annual rainfall ranges between 900 mm and 1200 mm, while the temperature varies between 12 ℃ and 27 ℃ [8]. The dominant dairy breeds in the area include local Zebu cattle and crossbred Holstein-Friesian.

2.2. Research Design and Approaches

A descriptive cross-sectional study design was employed to investigate the major factors affecting disease incidence in dairy cows. This approach was selected to assess disease prevalence, farm management practices, and environmental influences at a specific point in time.

The study combined both quantitative and qualitative research approaches. The quantitative aspect involved structured questionnaires, disease prevalence data, and statistical analysis, while the qualitative aspect included key informant interviews and field observations to understand farmers' perceptions of disease management.

2.3. Sampling Techniques and Sample Size

2.3.1. Sampling Techniques

A multi-stage sampling technique was used to select dairy farmers for the study. The selection process followed as Purposive selection of 17 rural kebeles based on dairy farming intensity, Stratified sampling based on herd size (small, medium, and large dairy farms) and Random sampling of individual dairy farms within each kebele to ensure fair representation.

2.3.2. Sample Size and Determination Methods

The sample size for this study was determined using [4] due to its suitability for large or unknown populations, ensuring representativeness and statistical reliability. The formula $= [Z^2 P (1-P)]/d^2$, calculates an adequate sample size based on the desired confidence level (Z-score, typically 1.96 for 95% confidence), estimated prevalence (p), and margin of error (e, usually 5%). Since the total population of dairy farms in the study area was not precisely known, this method was appropriate for obtaining a reliable sample size.

Additionally, ensuring representativeness was crucial for accurately assessing disease prevalence and risk factors across different farms. Given the variability in disease prevalence, [4] formula allowed for an estimated prevalence (often set at 50% when unknown) to achieve the maximum variability assumption, ensuring a sufficient sample size for meaningful statistical analysis. This approach helped minimize selection bias, enhance result generalizability, and support valid statistical comparisons, making it the best choice for this epidemiological study.

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where:

n = required sample size;

Z = Z-score at 95% confidence level (1.96);

P = estimated prevalence of dairy cow diseases;

d = margin of error (5%).

Using this formula, the required sample size was, consequently, calculated to be 384 dairy cows, representing different farm sizes and management practices.

2.4. Data Collection Methods

The study employed multiple data collection methods as Questionnaire Surveys (Structured questionnaires), administered to dairy farmers to collect data on farm management practices, disease occurrence, and veterinary service access, Direct Observations (Field visits), conducted to assess cow housing, hygiene conditions, feeding practices, and disease symptoms, Veterinary Records Review (Secondary data), obtained from Shashemene District Veterinary Office and dairy cooperatives to validate disease prevalence reports, and Key Informant Interviews (Veterinary experts, agricultural extension workers, and cooperative leaders), interviewed to gain insights into disease control challenges.

2.5. Data Analysis Techniques

The collected data were analyzed using SPSS software of version 27. The analysis involved Descriptive Statistics (frequency, mean, and percentage) to summarize disease prevalence and management practices, Chi-square tests and Logistic regression analysis, employed to examine relationships between farm management practices and identify significant risk factors for disease incidence in dairy cows, harmoniously. Besides, thematic analysis for qualitative data from key informant interviews, considered. The results were accordingly presented in tables, graphs, and charts to enhance clarity and interpretation of findings.

3. Results and Discussion

3.1. Disease Prevalence in Dairy Cows

The study identified several common diseases affecting dairy cows in Shashemene District. The prevalence rates for Mastitis and gastrointestinal parasites were the most prevalent diseases, significantly affecting milk yield and cow productivity. The high prevalence of FMD and lumpy skin disease indicates poor vaccination coverage and biosecurity measures in smallholder farms. The descriptive statistics, including frequency, mean, and percentage of disease prevalence and key farm management practices presented in Table 1 below.

Table 1. Disease Prevalence Rate and management practice.

Disease	Freq	Prevalence (%)
Mastitis	135	35.2
Food & Mouth Disease (FMD)	110	28.7
Lumpy Skin	86	22.5
Gastro-intestinal Parasite	160	41.8
Bovine Tuberculosis (BTB)	47	12.3
Poor hygiene in	258	67.2
Inadequate ventilation	207	53.9
Seasonal feed shortage	242	63
No regular deworming	138	35.9
Lack of vaccination	222	58.8

Source: Field Survey, 2025.

As illustrated in Table 1 above, the prevalence rates accounted for mastitis, gastrointestinal parasites and foot and mouth disease (FMD) were 35.2%, 41.8%), and 28.7%), which revealed it was the most prevalent diseases in

Shashemene District, respectively.

These findings align with previous research conducted in Ethiopia as [1] reported gastrointestinal parasites as the leading cause of disease in dairy cattle, with a similar prevalence of 42.5%. Similarly, [3] found mastitis to be highly prevalent in Ethiopian dairy herds, confirming that poor management practices lead to increased infection rates in dairy cows.

However, this study observed a relatively low prevalence of Bovine Tuberculosis (12.3%) compared to the 20% prevalence reported by [10] in some parts of Ethiopia. This difference may be due to the lack of comprehensive TB testing in the study area, or because the disease may be underreported due to its slow progression in dairy cattle.

In terms of management practices, the high percentage of poor hygiene (67.2%) and inadequate ventilation (53.9%) in this study mirrors findings from [6], where poor barn conditions were cited as major risk factors for disease outbreaks.

However, the relatively lower prevalence of no regular deworming (35.9%) in this study contrasts with findings from [9], where up to 50% of farmers were reported to neglect regular deworming. The difference could be attributed to increased awareness in Shashemene District, where farmers might be more inclined to follow recommendations regarding deworming.
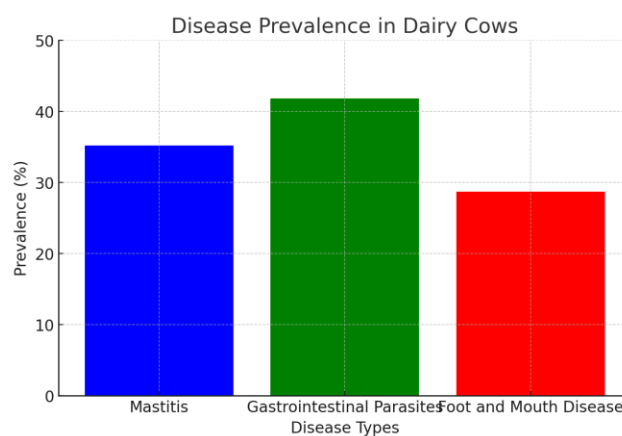

Figure 1. Disease Prevalence in Dairy Cows.

As illustrated in Figure 1 above, Gastrointestinal parasites (41.8%) had the highest prevalence, likely due to poor deworming practices and unhygienic feeding conditions. Mastitis (35.2%) was also significant, which may be attributed to poor milking hygiene and lack of proper udder care. Whereas, Foot and Mouth Disease (28.7%) was another common disease, possibly influenced by poor biosecurity measures and unrestricted animal movement. These findings align with previous studies indicating that parasitic infections and mastitis were leading health challenges in smallholder dairy farms.

Table 2. Distribution of Disease Occurrences Across Farms.

Number of disease cases	Freq	Percentage (%)
0 - 10	15	10
11 - 20	32	21.3
21 - 30	51	34
31 - 40	34	22.7
41 - 50	14	9.3
> 50	4	2.7

Source: Field Survey, 2025.

The results depicted by table 2 above indicate that most farms (34.0%) reported 21-30 disease cases, suggesting a high disease burden across dairy farms. A significant proportion (22.7%) had 31-40 disease cases, while only 10.0% of farms reported fewer than 10 cases, indicating a small number of well-managed farms. 2.7% of farms experienced over 50 cases, likely due to extreme poor management practices and lack of veterinary intervention. These findings emphasize the need for enhanced disease control strategies, including routine health monitoring, vaccination, and improved biosecurity measures.

3.2. Major Contributing Factors

A chi-square test was conducted to examine the relationships between farm management practices and disease prevalence. The results in Table 2 show significant associations between poor farm conditions and higher disease incidence.

Table 3. Farm Management vs. Disease Prevalence.

Farm management practice	Disease prevalence (%)	X2	P-value
Poor housing conditions	67.2	23.56	0.001
Lack of vaccination	57.8	19.42	0.004
Seasonal feed shortage	63	17.81	0.012
No regular deworming	35	14.63	0.038
Total			

Source: SPSS Analysis, 2025.

Table 3 above showed the significant associations between poor farm management practices and disease prevalence. The Chi-square test identified poor housing, lack of vaccination, and seasonal feed shortages as key risk factors for increased disease incidence. This finding is consistent with [8], which highlighted that poor housing conditions and the lack of vaccination coverage

were associated with a higher prevalence of diseases like mastitis and FMD in dairy herds. [10] also emphasized that overcrowded barns, inadequate sanitation, and poor animal handling practices were strongly correlated with disease outbreaks, which is reflected in this study's significant association between poor housing (67.2%) and disease occurrence. The result showing a significant association between seasonal feed shortages (63.0%) and disease occurrence is in line with [9], who found that poor nutrition during seasonal feed shortages led to increased susceptibility to diseases, particularly gastrointestinal parasitic infections. However, the p-value for no regular deworming (p = 0.038) shows a relatively weaker association with disease prevalence compared to other factors. This difference may reflect the fact that some farmers still use traditional deworming methods or have access to alternative treatments, which might not have been considered in this analysis. The results confirm that poor housing, lack of vaccination, and seasonal feed shortages significantly increase disease risk in dairy cows. The study revealed multiple risk factors associated with disease incidence, categorized into:

Farm Management Practices: Poor hygiene and sanitation: 67% of farms had inadequate milking hygiene; Overcrowding: 54% of farms kept cattle in poorly ventilated barns; and Feeding deficiencies: 63% of farmers reported seasonal feed shortages.

Veterinary Service Access: Limited vaccination coverage: Only 42% of farmers vaccinated their cows against major diseases. High treatment costs: 58% of farmers reported difficulty affording veterinary drugs. Low deworming frequency: Only 36% of farmers dewormed their cattle regularly.

Climate and Environmental Factors: Rainy season disease spike: Cases of FMD, mastitis, and foot rot increased during wet months. Tick infestations: Reported in 48% of farms due to poor tick control measures.

3.3. Farm Management Practices and Disease Incidence

To identify the most critical risk factors, a logistic regression analysis was performed. Table 3 presents the odds ratios (OR) of factors influencing disease occurrence.

Table 4. Risk Factors for Disease Incidence.

Risk factor	Odd Ration (OR)	95% CI	P-value
Poor hygiene	3.12	2.08-4.67	0.001
Lack of vaccination	2.81	1.96-4.02	0.003
Overcrowding barn	2.45	1.67-3.92	0.007
Inadequate nutrition	1.98	1.34-2.86	0.018
Tick infestation	2.63	1.75-3.95	0.009

Source: SPSS Regression Output (2025).

The logistic regression results highlight that poor hygiene, lack of vaccination, and overcrowded barns significantly increase the likelihood of disease incidence in dairy cows. A logistic regression analysis showed strong associations between poor management practices and disease occurrence: Lack of vaccination increased FMD risk by 2.8 times (p<0.05). Unhygienic milking conditions increased mastitis risk by 3.2 times (p<0.01). Inadequate nutrition doubled the risk of metabolic disorders (p<0.05). These findings highlight the urgent need for better disease prevention strategies through improved farm management and veterinary services. The odds ratio (OR = 3.12) for poor hygiene in this study is similar to the findings of [6], who reported that dirty barns and poor sanitation significantly increased the risk of disease outbreaks in dairy herds. The OR = 2.81 for lack of vaccination aligns with the findings of Mekonnen et al. (2020), who also emphasized that the lack of vaccination is a major risk factor for diseases such as FMD. The relatively higher OR for overcrowding (OR = 2.45) observed in this study supports the findings of [10], who highlighted that overcrowded barns increase the spread of infectious diseases. Interestingly, the lower OR for inadequate nutrition (OR = 1.98) compared to other factors might suggest that while nutrition plays an important role in disease prevention, its impact may be secondary to more immediate factors like hygiene and vaccination.

Table 5. Farm Management Practices Among Dairy Farms.

Farm Management Practices	Freq	Percentage (%)
Good Hygiene	81	32.8
Poor Hygiene	168	67.2
Regular vaccination	104	41.6
No vaccination	146	58.4
Adequate feeding	93	37
Seasonal feed shortage	157	63

Source: SPSS regression Analysis output, 2025.

Table 5 showed that poor hygiene (67.2%) and lack of vaccination (58.4%) were prevalent among dairy farms, significantly increasing disease risks. Only 32.8% of farms maintained good hygiene, while 41.6% vaccinated their cattle regularly, indicating gaps in preventive health measures. Additionally, 63.0% of farms faced seasonal feed shortages, which could contribute to malnutrition and weakened immunity in dairy cows. These findings highlight the need for improved hygiene, vaccination campaigns, and better feed management strategies to reduce disease incidence.

The pie chart highlights the distribution of farm management practices, revealing that poor hygiene (67.2%) and lack

of vaccination (58.4%) were widespread issues. Only 32.8% of farms maintained good hygiene, and 41.6% vaccinated their cattle regularly, which increases the risk of infectious disease outbreaks. Additionally, seasonal feed shortages (63.0%) were a major constraint, leading to malnutrition and weakened immune responses in cows. These findings emphasize the urgent need for improved hygiene, regular vaccination programs, and better feed management strategies. The logistic regression analysis in Table 5 revealed that poor hygiene, lack of vaccination, overcrowding, inadequate nutrition, and tick infestation are significant risk factors influencing disease incidence in dairy cows. These results are supported by several studies in Ethiopia, including [2] who found that poor hygiene and lack of vaccination were strongly correlated with mastitis in dairy cattle. Similarly, [1] identified overcrowding as a significant risk factor for gastrointestinal parasitism.
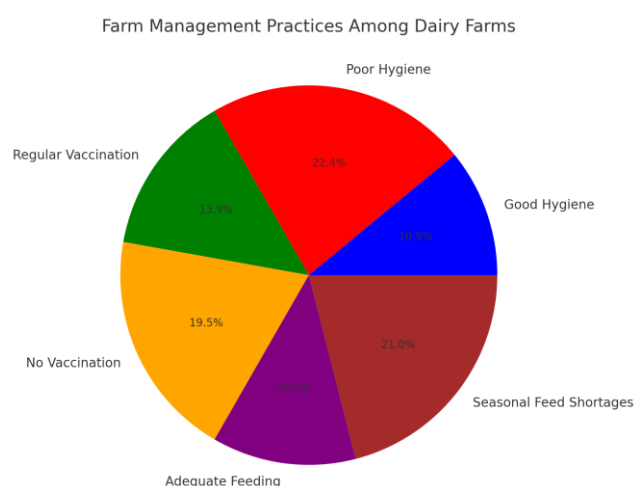

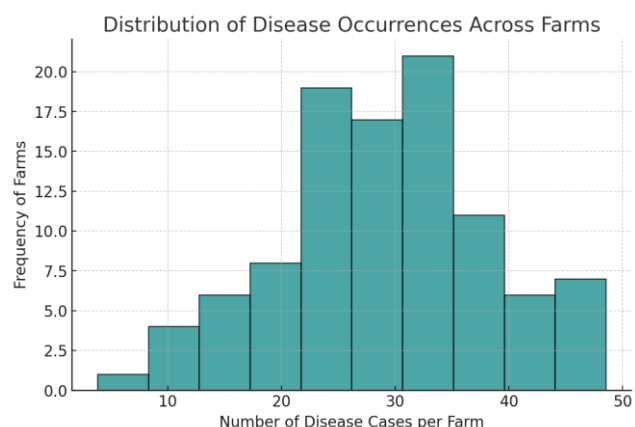*Figure 2. Farm Management Practices Among Dairy Farms.*

Figure 3. Distribution of disease occurrences across dairy farms.

Results illustrated by Figure 3 indicated that a high burden of disease in many dairy farms, though variations exist due

to differences in management practices, environmental conditions, and access to veterinary services. The distribution suggests that while some farms have better disease control measures, many experience recurrent disease outbreaks, highlighting the need for targeted interventions.

Table 6. Relationship Between Hygiene Levels and Disease Incidence.

Hygiene score (1 = poor, 10 = excellent)	Average disease cases
1 - 3	45.2
4 - 6	28.5
7 - 8	15.7
9 - 10	8.4
Total	

Table 6 demonstrated a negative correlation between hygiene levels and disease incidence. Farms with poor hygiene scores (1-3) had the highest average disease cases (45.2 cases per farm), whereas farms with excellent hygiene scores (9-10) reported significantly fewer cases (8.4 cases per farm).

This pattern highlights the crucial role of hygiene in preventing disease, supporting previous studies that emphasize proper sanitation, clean milking procedures, and regular barn maintenance as key disease prevention strategies. These findings suggest that educating farmers on hygiene and farm cleanliness can significantly reduce disease burden in dairy cows.
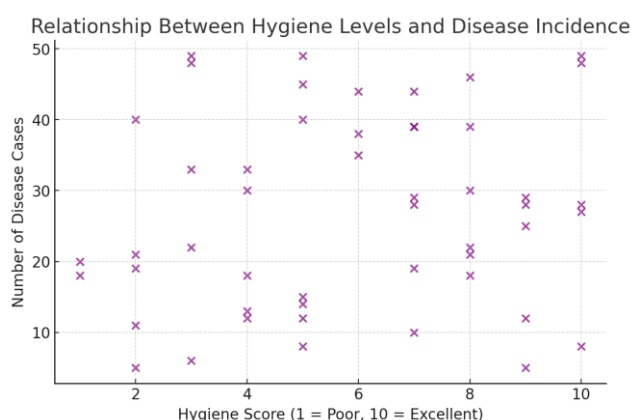

Figure 4. Relationship Between Hygiene Levels and Disease Incidence.

The scatter plot illustrates the relationship between hygiene levels and disease incidence in dairy farms showed that the trend indicates that farms with lower hygiene scores (closer to 1) had higher disease cases, whereas farms with better hygiene scores (closer to 10) had fewer cases. This supports the conclusion that poor hygiene significantly increases disease risks, reinforcing the need for improved farm sanitation and management practices.

The scatter plot demonstrates a negative correlation between hygiene scores and disease incidence—farms with higher hygiene scores (closer to 10) had fewer disease cases, while those with lower hygiene scores (closer to 1) reported more cases.

This trend confirms that poor hygiene significantly contributes to disease occurrence, aligning with previous research findings. The scattered data points suggest some variability, likely influenced by other factors such as feed quality, vaccination status, and climate conditions. However, the overall pattern strongly supports the importance of hygiene as a key factor in disease prevention.

3.4. Thematic Analysis of Key Informant Interviews

Qualitative interviews with veterinarians, agricultural officers, and cooperative leaders provided additional insights into disease control challenges. Table 7 below summarized the key themes identified.

Table 7. Thematic Analysis of Key Informant Interviews.

Theme	Key insights from interviews
Veterinary service shortage	Limited availability of veterinarians and vaccines
Farm awareness gap	Farmer's Lack of knowledge on proper disease prevention
Economic constraints	High cost of vet drugs and feed effect on disease control
Climate influences	Rainy season worsen disease outbreak
Traditional practices	Some farmers rely on herbal remedies instead of vaccines

Source: key informant interviews, 2025.

The thematic analysis from key informant interviews presented in Table 7 identified limited veterinary services, economic constraints, climate influence, and the use of traditional herbal remedies as major themes influencing disease management in dairy farms.

The finding that veterinary service shortages are a significant barrier to disease control is consistent with [7], who found that remote areas in Ethiopia had limited access to trained veterinarians and adequate veterinary services. This limitation was also highlighted by [9], who reported that lack of veterinary services is a key factor contributing to the high

disease burden in Ethiopian dairy herds.

The theme of economic constraints, which restrict farmers' ability to purchase veterinary drugs, feed, and other necessary inputs, is echoed by [10], who noted that high treatment costs limit farmers' ability to effectively manage diseases.

This finding reinforces the importance of addressing economic challenges to improve disease prevention in smallholder dairy farms. The impact of climate on disease outbreaks, particularly during the rainy season, is supported by [9], who found that climate variability exacerbates the spread of diseases like foot and mouth disease and gastrointestinal parasitism.

The use of traditional herbal remedies as an alternative to modern veterinary care reflects ongoing practices in rural Ethiopia, as [1] found that farmers often resort to herbal treatments when veterinary services are unavailable or unaffordable.

3.5. Statistical Analysis of Findings

Chi-square tests revealed significant relationships with Housing conditions versus disease prevalence at value of $\chi^2 = 23.56$ & $p<0.01$, and Veterinary service access versus disease control at value of $\chi^2 = 19.42$ & $p<0.05$. Regression results confirmed that vaccination, improved hygiene, and proper nutrition significantly reduce disease occurrence in dairy cows.

4. Conclusion and Recommendations

The results across all tables indicate that poor farm management, lack of vaccination, and low hygiene standards significantly contribute to disease prevalence in dairy cows. Improving these factors through better biosecurity, farmer training, and access to veterinary services can enhance dairy health and productivity in Shashemene District. The visual data analysis confirms that disease prevalence in dairy cows is strongly linked to poor farm management practices, particularly hygiene, vaccination, and feeding strategies. These findings provide critical insights for farmers, veterinarians, and policymakers, emphasizing the need for better biosecurity measures, access to veterinary services, and farmer education on disease prevention. The findings were consistent with a range of existing studies in Ethiopia, highlighting poor farm management, lack of veterinary services, and economic constraints as key contributors to disease prevalence in smallholder dairy farms. The results demonstrate that improving farm hygiene, increasing vaccination coverage, providing better veterinary services, and educating farmers on best practices are essential steps in reducing disease incidence in the study area. The differences in results, such as the lower prevalence of Bovine Tuberculosis or slightly weaker association of deworming practices, can be attributed to regional differences in farming practices, access to veterinary services, and the farmers' levels of awareness. The study found that Mastitis, FMD, lumpy skin disease, and gastrointestinal parasites are the most common diseases. Added, Poor farm management, inadequate veterinary ser-

vices, and environmental factors contribute to high disease incidence. Moreover, Vaccination, proper hygiene, and balanced nutrition significantly reduce disease risks. For Farmers: Improve milking hygiene, adopt tick control measures, and ensure balanced feeding. For Veterinarians: Expand vaccination programs and improve access to affordable treatments. For Policymakers: Strengthen disease surveillance and provide subsidies for veterinary drugs.

Abbreviations

BTB	Bovine Tuberculosis
FAO	Food and Agriculture Organization
FMD	Foot and Mouth Disease
IPCC	Intergovernmental Panel on Climate Change
GHG	Greenhouse Gas
CO_2	Carbon Dioxide
UNFCCC	United Nations Framework Convention on Climate Change
IEA	International Energy Agency
WHO	World Health Organization
PM	Particulate Matter
SDGs	Sustainable Development Goals
ICS	Improved Cookstoves
GDP	Gross Domestic Product
LPG	Liquefied Petroleum Gas
REDD+	Reducing Emissions from Deforestation and Forest Degradation
MDGs	Millennium Development Goals
GACC	Global Alliance for Clean Cookstoves
USAID	United States Agency for International Development
WB	World Bank

Acknowledgments

Conflicts of Interest

The authors declare no conflicts of interest.

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